TODAY'S TAKE ON EINSTEIN'S RELATIVITY

PROCEEDINGS OF THE CONFERENCE OF 18 FEB 2005

Edited by
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and
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Pima Community College, East Campus

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TODAY'S TAKE ON EINSTEIN'S RELATIVITY

PREFACE

Non Sequiturs in Relativity
Four in number at this point
Dr. Smith of "Lost in Space" had a knack of easing out of binds
that he'd gotten himself into. Dr. Einstein was a little like that.

Einstein originally declared that the distortions of special relativity reflect real changes to the objects being remotely observed, then reconsidered. The first non sequitur is quoted here from Sachs:[1]

> *In a lecture that Einstein gave to the Prussian Academy of Sciences in 1921, he said the following: "Geometry predicates nothing about relations of real things, but only geometry together with the purport of physical laws can do so... The idea of the measuring rod and the idea of the clock contained with it in the theory of relativity do not find their exact correspondence in the real world. It is also clear that the solid body and the clock do not in the conceptual edifice of physics play the part of irreducible elements, but that of composite structures, which may not play any independent part in theoretical physics." / Einstein then went on to say that, in spite of the foregoing comment, we should temporarily support the use of the length and time transformations as though they were physically real.*

Sachs then quite understandably objects to that "non sequitur" as he called it. Einstein obviously, in 1921, had second thoughts about some of the things he had written in 1916 and earlier in connection with special relativity. One is the twin paradox; another is his declaration of an absolute light barrier, since he had based that on the shrinking of lengths to zero,

and the slowing of clocks as the speed of light is approached. This leads to our second non sequitur. However, rather than admit he had changed his mind, he eased into his new view while saying the old one should be accepted a bit longer.

A second non sequitur in relativity is the common belief that a rocketship cannot go faster than light. We've discussed the non sequiturian nature of that belief in some detail here and there in previous papers, and we summarize it now like this:

Since there is no luminiferous ether, there can be no "road" in space upon which to conceptually post a sign like this for rocketships:

SPEED LIMIT 300 MEGAMETERS PER SECOND
STRICTLY ENFORCED

What is "300 megameters per second"? That's just the speed of light.

A third non sequitur appears in connection with the twin paradox. Nahin, Time Machines, p.460:[2]

> *Einstein himself, in his 1905 paper, specifically took the rate of a clock's timekeeping to be velocity-dependent only. However [there are] those who object. In this book I side with Einstein. When asked during a 1952 interview whether it is permissible to use special relativity in problems involving acceleration, Einstein replied, "Oh yes, that is all right as long as gravity does not enter; in all other cases, special relativity is applicable. Although, perhaps the general relativity approach might be better, it is not necessary."*

Looks like another non sequitur, and an easing back by Einstein from an earlier position; for aren't gravitation and acceleration fields equivalent?

Our fourth non sequitur follows from this quotation of Einstein's as reported by Rosser, p.398:[3]

The theory of relativity is often criticized for giving, without justification, a central theoretical role to the propagation of light, in that it founds the concept of time upon the law of propagation of light. The situation is, however, somewhat as follows. In order to give physical significance to the concept of time, processes of some kind are required which enable relations to be established between different places. It is immaterial what kind of process one chooses for such a definition of time. It is advantageous, however, for the theory to choose only those processes concerning which we know something certain.

"Immaterial"? Consider that an atomic clock will run slower in a stronger gravitational field but a pendulum clock will run faster there. Non sequitur.

The upshot of all this is that the theory of relativity needs some heavy-duty reinterpreting.

Homer B. Tilton
Tucson, Arizona
11 August 2005

References:
[1] Mendel Sachs, "On Einstein's Later View of the Twin Paradox," Foundations of Physics, Vol.15, No.9, Sep. 1985, pp.977-80
[2] Paul J. Nahin, Time Machines, 2nd Ed., Springer, 1998, ISBN 0-387-98571-9, p.408
[3] W.G.V. Rosser, An Introduction to The Theory of Relativity, London, Butterworths, 1964, p.398

Twentieth-Century Flockery

The leader declares that Achilles cannot beat the tortoise in a race in which the tortoise is given a head start. Everyone flocks around the leader, no matter that his declaration defies common sense. A thousand years later someone realizes, "Hey, he can too. I know because I just did it."

Time passes. The 20th century arrives.

The leader declares that the speed of light can neither be reached nor exceeded. Everyone flocks around the leader. Stand by while another millennium passes.

ABOUT THE COVER

The cover shows a rocketship, a cable car, and a banjo. The significance of each of those items is revealed here.

The rocketship denotes that a rocket motor, in effect, has traction to empty space. A rocket does not require air to push against as was once thought by the masses. It can and does, indeed "push against" empty space.

The cable car summarizes the fact that some forms of propulsion are, just as a cable car is, limited to the speed of light or the speed of the cable. An example is the particles in a particle accelerator where the "motor" - the coils and electrodes - are fixed to the laboratory. Another example is Cosmos I, the light-propelled spaceship proposed, and launched (then which disappeared) by the Planetary Society. They are like a cable car if you stop and think about it.

The banjo symbolizes how plucking a taut string causes the string to vibrate at its resonant frequency just as an electric spark causes space to "vibrate" at its resonant velocity, c, showing why the speed of a beam of light is independent of observer motion.

Welcome from Campus President, Dr. Raul Ramirez

Welcome to all the participants in this conference, and a special welcome to the distinguished author and professor, Florentin Smarandache. Intellectual stimulation is an important part of education, and it is vitally important to review theories on a regular basis. This 100th anniversary of Einstein's Theory of Relativity provides a wonderful opportunity to revisit this significant theory of physics. Have a productive meeting.

Registrants/Attendees

Barbara	Armenta	/	Mathematics	/	Pima Community College, EC
Steve	Hoell	/	Mathematics	/	Pima Community College, EC
Greg	Holmberg	/	Mathematics	/	Pima Community College, EC
Dr. David	Iadevaia	/	Astronomy	/	Pima Community College, EC
Jim	Malmberg	/	Mathematics	/	Pima Community College, EC
William	Martin	/	Mathematics	/	Pima Community College, EC
Kirk	Mehtlan	/	Mathematics	/	Pima Community College, EC
Jim	Oliver	/	Computer Science	/	Pima Community College, EC
Dr. Raul	Ramirez	/	President	/	Pima Community College, EC
Jason	Ritter	/	Mathematics	/	Pima Community College, EC
Dr. Florentin	Smarandache	/	Mathematics	/	U of New Mexico @ Gallup
Mary Ann	Smith	/	Mathematics	/	Pima Community College, EC
Dr. Paul	Welsh	/	Mathematics	/	Pima Community College, EC

KEYNOTE
by Homer Tilton

Welcome, all, to this first annual meeting, the zero point, of the SoAz Starbase Society. We come here to reason together, not to defend turf or engage in fantasy. More than anyone, Albert Einstein (14 March 1879 to 18 April 1955) set the tone, as it remains to this day, for humankind's starflight aspirations. In 1916, pursuant to his 1905 landmark paper, he wrote.

“From this we conclude that... the velocity c plays the part of a limiting velocity, which can neither be reached nor exceeded by any real body."

A primary purpose of this conference is to closely examine those most damning words of Einstein's which nearly everyone accepted.

Einstein is reported also to have said,

“Try and penetrate with our limited means the secrets of nature and you will find that ...there remains something subtle, intangible and inexplicable. Veneration for this force beyond anything that we can comprehend is my religion."

Ask yourself: Do you understand all you know about relativity, or do you just accept large parts of it on faith? Do you have faith that the traveling twin will age less than his stay-at-home sibling? Is that what the dilation of time with velocity means? Is that kind of "time travel" an assured, preordained thing? And do you accept that future probes will somehow be prevented from reaching Beta-Centauri (190 lt·yr away) before Marconi's original radio signal can? Isn't unquestioning adherence to faith and acceptance called religion? It's true that not many among us can spare the time to acquire a full independent understanding of relativity; but one must know that a myriad of scientists CAN be wrong; the constancy of the speed of light as spelled out by the second postulate does NOT equate to a light barrier and time travel in the popular sense, although a sampling of popular and scientific opinion shows that nearly everyone believes it does. It is a popular notion, alright. But perhaps it is only a contemporary myth. Such action is not built into the mathematics.

We strive here and now for understanding. We must engage in plain talk. Park your sensitivities outside the door to this house of cerebration. Each of you will be given an opportunity to have your say during question & answer sessions. We are here to ferret out logical reasons for the presumed universal, impenetrable light barrier together in a cooperative process. There are those who say the reasons don't have to be logical. I, for one, find that smacks of religion, not science. We are here to achieve scientific understanding, not simply an agreed-on acceptance.

THE LIGHT BARRIER: ITS CONSTRUCTION AND DEMOLITION
angle brackets enclose paraphrasings

Its construction -

<The velocity of light acts as an infinite velocity.>
...A. Einstein, his landmark 1905 paper

<Thus c cannot be reached or exceeded by any real body.>
...A. Einstein, book Relativity, 1919

<This Venerable Force is my religion.>
...A. Einstein

The turning around -

<When all is said and done, Poincaré was right; the relativistic effects are not real.>
...A. Einstein, book *Sidelights On Relativity*, p.35, 1922

"...I spent my life to find out what a photon is and I still do not know."
...A. Einstein, sometime late in life

The dissenters -

"But I never thought that this [transformed time] had anything to do with real time."
...H. Lorentz, 1927

<The relativistic increase of mass with velocity may be only a sort of kinematical perspective.>
...Richtmyer & Kennard, Cornell physicists, 1928, 1934, 1942, 1947

The diehard believers -

<The twin paradox should really be called the `Twin Effect'.>
<To be sure, there will always be dissenters who refuse to believe.>
...M & M

<The speed of light cannot be exceeded.>
<Mass grows with velocity.>
... Z & Z (typical popularization)

"It is difficult to go to the stars. They are far away and the speed of light [barrier] limits us to a slow crawl along the starlanes. Decades and centuries will pass before the stay at homes learn what the explorers have found."
...Robert L. Forward, The Planetary Society, 1986

The hanging-on -

<But the speed of light cannot be exceeded.>
...Mendel Sachs, early 2004

"The reason that nothing can move faster than c is that in sr, c is the maximum speed of propagation of ... force. The reason that a body moves is that it was caused to do so by a force (originating in another body). If the body would move faster than c the force could not catch up with it to make it move [like that]."
...Mendel Sachs, late 2004

Its demolition -

<It is indeed known that the velocity of light is no speed limit.>
...Robert Parmenter, physicist, U of Arizona, Told to H. Tilton ca. 1972

<The relativistic effects are only a kinematical perspective.>
...Akhlesh Lakhtakia, 2004, Distinguished materials engineer, Penn. State U.

<The traveling twin will not age differently.>

...Mendel Sachs, 1972

<Practitioners know that mass does not grow with velocity.>

...Don Lincoln, research physicist, Fermilab, 2005

Cutting-edge stuff: "stopped light", "frozen light", "superluminary light",

...Photonics Spectra, Physics Today, various recent news items

Why You Can't Exceed the Speed of Light

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Abstract: The discussion of the issue of whether a rocket under constant acceleration can exceed the speed of light is best resolved by applying the rules of relativistic mechanics to the problem, determining the equations of motion of the rocket, and allowing the outcome to be resolved by the result. The results indicate that the rocket does not exceed the speed of light in the "rest" coordinate system or in the coordinate system moving with the rocket, even if infinite time is allowed.

The assertion has been made that if a rocket simply accelerates long enough it will exceed the velocity of light. For example a rocket accelerating at one gravity (980 cm/sec^2) for one year will have a velocity of $980 \cdot 60 \cdot 60 \cdot 24 \cdot 365 = 3.05x10^{10}\, cm/\sec$ exceeding the velocity of light $3.00x10^{10}\, cm/\sec$.

To see if this is true one needs to solve for the equations of motion of the rocket and determine its velocity using the principles of the theory of relativity.

The problem has been solved by several authors. Misner, Thorne and Wheeler, Gravitation, 1973, pp. 166-167 give the following solution. A detailed solution of the problem is available in a separate paper entitled “Solution of the Constant Acceleration Problem”.

The equation of motion of a rocket accelerating at a constant one Earth gravity in the x direction in the fixed frame, the unaccelerated frame in which it began to accelerate, is

$$t = \frac{1}{g} Sinh(g\tau)$$
$$x = \frac{1}{g} Cosh(g\tau) \qquad (1)$$
$$y = z = 0$$

where t, x, y and z are the coordinates of the rocket in a system at rest relative to the rocket's starting point, g is the acceleration of the rocket as measured in a frame moving with the rocket and the parameter τ is the time measured by a clock in the rocket. The units used in these equations are "natural coordinates" in which the velocity of light, c, is taken to be one. In investigating the problem it is convenient to convert to cgs units and then to units in which time is expressed in years and distance in light years. This eliminates many powers of ten in the discussion. In cgs units the $g\tau$ terms must be divided by c to preserve the ratio to c nature of the arguments of the hyperbolic functions. Then to get the time coordinate the 1/g term in the t equation must be multiplied by c to get c/g which does indeed have units of seconds and to get the x coordinate the 1/g term in the x equation must be multiplied by c^2 to get c^2/g which does have units of cm.

$$t = \frac{c}{g} Sinh(\frac{g\tau}{c})$$
$$x = \frac{c^2}{g} Cosh(\frac{g\tau}{c}) \qquad (2)$$
$$y = z = 0$$

Now let g = 980 cm/sec and c = $3.00x10^{10}\, cm/\sec$ and make use of the fact that a year is $60 \cdot 60 \cdot 24 \cdot 365 = 3.1536x10^7$ seconds and a light year is $60 \cdot 60 \cdot 24 \cdot 365 \cdot 3x10^{10}$ cm which equals $9.4608x10^{17}$ cm. to write

$$t = 0.971 Sinh(1.030\tau)$$
$$x = 0.971 Cosh(1.030\tau) \qquad (3)$$
$$y = z = 0$$

where now t and τ are in years and x is in light years.

Now we are in a position to ask "How fast is the rocket moving?" Simply differentiate x with respect to t to obtain the velocity v of the rocket in the fixed frame.

$$v = \frac{dx}{dt} = \frac{dx}{d\tau}\frac{d\tau}{dt} = \frac{dx}{d\tau}\frac{1}{\frac{dt}{d\tau}} = \frac{\frac{dx}{d\tau}}{\frac{dt}{d\tau}} = \frac{\frac{d}{d\tau}\left(0.971Cosh(1.039\tau\right)}{\frac{d}{d\tau}\left(0.971Sinh(1.030\tau\right)}$$

$$= \frac{0.971 \cdot 1.030Sinh(1.030\tau)}{0.971 \cdot 1.030Cosh(1.030\tau)} = Tanh(1.030\tau) \qquad (4)$$

This indicates the that the fastest the rocket can go, as measured in the fixed frame, is one light year per year, or just the velocity of light, as the limit of Tanh is 1.0 as its argument approaches infinity. But the navigator in the rocket after one year of rocket clock time thinks he should have exceeded the velocity of light because he accelerated for one year at one gravity. Has he? Does he think he has done so? The answer is "No". A fixed observer will see the rocket traveling with the velocity given by Equation (4) so he will say that the rocket does not exceed the velocity of light. What about the navigator in the rocket? He will see the observer at the start point receding at the same velocity. This must be true because, if the rocket motor is shut down, the rocket is at rest in an inertial frame moving with the rocket, Relativity says that the two observers, one at the start point and one in the rocket must measure the same relative velocity because neither knows which is moving and which is at rest from any observation they can make without references other than the observers themselves. So the navigator will be very puzzled because he should be traveling at the velocity of light but is not. What is wrong?

Lets conduct a "thought experiment" to see if we can figure out what's going on. Lets say that after the rocket has accelerated for some months it has reached a velocity of half the speed of light. The navigator on the rocked drops a probe with a radar at that point and programs the probe to measure its speed by measuring the distance to passing asteroids and comets. Since it's a thought experiment we can assume the necessary asteroids and comets are there. Also assume that the rocket's home base has a radar with which it can measure the probe's speed. Call the fixed

home base observer O and the probe dropped at the half speed of light observer O'. The speed of the probe must be the speed of the rocket at the time the probe was dropped. The reports of speed from the probe O' and home base O come in and, as expected, both say their relative velocities are c/2. So far so good.

The navigator decides to accelerate for another month when he should have added about 0.1/c to his speed, drop another probe, O'', and again measure speeds. He does so and gets the speed reports from O' and O''. As expected they report their relative velocities as 0.1/c. Then the navigator compares the reports from O and O''. They report their relative velocities are 0.571c not 0.6c as expected. What happened? The problem is that velocities do not simply add at relativistic speeds. Rather one must use the formula (from Bergman, Introduction to the Theory of Relativity, 1942, p 43)

$$v = \frac{v' + v''}{1 + \frac{v'v''}{c^2}} \qquad (5)$$

where v' is the velocity of O' with respect to O and v'' is the velocity of O'' with respect to O'. Using the velocity formula (4) we get that the rocket goes 0.5c when τ is 0.5493 years. The rocket will accelerate to 0.1/c in about 0.0971 years. So for τ = 0.5493 + 0.0971= 0.6403 equation (4) gives a velocity of 0.565 in close agreement with equation (5) which gives 0.569 (The disagreement comes because we applied equation (5) to the 0.1c increment as one increment rather than breaking it into many smaller increments.) So no matter how long the rocket accelerates, no matter how fast the navigator thinks he should be going the rocket can never exceed the velocity of light. Each increment of added speed is less and less effective in increasing the rocket's speed as it nears light velocity. There is no need to cite any rules about increasing mass or infinite force being needed to accelerate the rocket. Even if infinite energy is available it still will not cause the rocket to exceed the velocity of light. The limiting velocity of material objects is the speed of light.

A final comment. The limit on the velocity of the rocket does not come from Equation (5), the formula for the relativistic composition of velocities. Equation (5) is used above simply to explain what is happening. The limit comes from solving for equations of motion of the rocket and computing its velocity. The result follows simply from the application of the principles of relativity that Lorentz transformations relate observations between observers in inertial frames, that observations by various observers in inertial frames of the same events must agree (general covariance) and the relativistic equations of motion which follow.

A final, final comment. The argument has been made that the mathematics are correct, but that the "apparent" velocities are just an illusion like the apparent bending of a straight stick extending into a pool of water. This is false. The predictions of relativity are real and have been experimentally verified (see chapter 38 Misner, Thorne and Wheeler for a detailed discussion of experimental results). Verification of the composition of velocities formula near the speed of light is also provided by particle accelerators which accelerate particles near, but never beyond, the velocity of light. Time dilation has been verified by measuring the lifetimes of unstable particles in cosmic ray debris and particle accelerator experiments. Experiment is the final arbiter in science, and experiment verifies that the velocity of light is the speed limit.

The Theory of Relativity is incomplete, since it is not compatible with Quantum Mechanics. At some future time relativity will be replaced by a more complete theory, just as Newtonian mechanics was replaced by relativity, but whatever replaces relativity must still agree with the predictions of relativity in those cases where experiment has shown relativity to be correct.

Solution of the Constant Acceleration Problem
Jim Malmberg

This problem has been solved by several authors. The solution presented here follows Misner, Thorne and Wheeler, Gravitation, pp166-167. The solution presented in the reference does not include the details and it is the intention here to provide these details to make the solution understandable to those, who like myself, lack a PhD in physic.

To solve the problem consider two reference frames, both inertial. The first is the rest frame. The second is an inertial frame in which, at any given instant, an accelerating rocket is at rest. This frame would correspond to the frame the rocket would be in if its motor were shut down at that instant. Clearly the rocket does not remain in the moving inertial frame but it is clear the such a frame exists for each instant of the rocket's proper time (proper time is the time measured by a clock in the rocket).

We will also need to use some principles from tensor calculus to solve the problem. What we need is the fact that any equation written in tensor notation, correct in one frame, is also correct in any other frame of reference related to the first by a Lorentz transformation. The rest frame and the co–moving instantaneous inertial frames are related by Lorentz transformations and will hence have the necessary property. We must also deal not in ordinary vectors, but in tensors, or relativistic 4-vectors. The specific 4-vectors needed are position, velocity and acceleration. The position 4-vector is x^α = (t,x,y,z) and it defines a path in space/time called a world line. The 4-velocity is $u^\alpha = \frac{d}{dt}x^\partial$ and the 4-acceleration is $a^\alpha = \frac{d}{dt}u^\alpha$. One must be careful to only do the differentiation in a particular frame with the appropriate variables, as, in general, a simple differentiation destroys the tensor quality of 4-vectors. We also need the metric tensor $g_{\alpha\beta}$ where g_{00} = -1, g_{ij} =1 for i,j=1,2,3 and $g_{\alpha\beta}$ =0 otherwise.

Now it is necessary to write some equations. In what follows $y = z = 0$ in all frames because motion occurs only in the x direction. First, in any inertial frame, the square of the velocity is

$$(|u|)^2 = u^\alpha u_\beta = u^\alpha g_{\alpha\beta} u^\beta = -u^0 u^0 + u^1 u^1 \quad (1)$$

and in the case of the moving instantaneous frames where $u^\alpha = (1,0,0,0)$ we have

$$-u^0 u^0 + u^1 u^1 = -1 \quad (2)$$

But since (2) is true in one inertial frame it must be true in all inertial frames. Next consider that the velocity in the moving instantaneous frame is constant. If the velocity is constant but the acceleration is not zero, then the acceleration must be perpendicular to the velocity, which is expressed as

$$\mathbf{a} \cdot \mathbf{u} = a^\alpha g_{\alpha\beta} u^\beta = -a^0 u^0 + a^1 u^1 + a^2 u^2 + a^3 u^3 = -a^0 u^0 + a^1 u^1 + 0 + 0 = -a^0 u^0 + a^1 u^1 = 0 \quad (3)$$

Again, this condition must be true in all inertial frames. Finally, consider that the acceleration is constant so

$$(|a|)^2 = a^\alpha a_\alpha = a^\alpha g_{\alpha\beta} a^\beta = -a^0 a^0 + a^1 a^1 = g^2 \quad (4)$$

From (2), (3) and (4) we have a set of three simultaneous equations in four variables, u^0, u^1, a^0, and a^1

$$\begin{aligned} -u^0 u^0 + u^1 u^1 &= -1 \\ -a^0 u^0 + a^1 u^1 &= 0 \\ -a^0 a^0 + a^1 a^1 &= g^2 \end{aligned} \quad (5)$$

The system (5) can be solved for any of the variables in terms of the other three variables. Specifically

$$a^0 = \frac{du^0}{d\tau} = u^1 g \quad (6)$$

$$a^1 = \frac{du^1}{d\tau} = u^0 g \quad (7)$$

and with the proper choice of initial conditions the solution is

$$u^0 = Cosh(g\tau) \quad (8)$$

$$u^1 = Sinh(g\tau) \quad (9)$$

But in the rest frame $u^0 = dt/d\tau$ and $u^1 = dx/d\tau$ so the equations of motion in the rest frame are

$$t = \int u^0 d\tau = \int Cosh(g\tau) d\tau = \frac{1}{g} Sinh(g\tau) \tag{10}$$

$$x = \int u^1 d\tau = \int Sinh(g\tau) d\tau = \frac{1}{g} Cosh(g\tau) \tag{11}$$

which is the desired solution for the equations of motion of the rocket in the fixed frame in which it began to accelerate. Note that the proper time as measured by a clock on the rocket, τ, is the parameter in the equations of motion.

A Curious Result

Dr. David Iadevaia
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My original talk was based on a curious result hence the title. However, as I was reviewing my curious result I discovered that I made a rather curious mistake with a subscript! So this talk has kept the title but without the curious result, which was an error!

There is ample physical evidence that suggests that Einstein's relativity is as it seems to be. Time dilation, length contraction and increased inertia (mass) all tied to large velocities of moving matter. Gravitational effects on these metrics have been successfully measured.

During the years following Einstein's publication of his relativity theories questions have been raised regarding whether theses effects are real or illusionary. Pushing a particle through an accelerator indeed requires more energy to increase its velocity because its inertia measurably increases as its velocity approaches a significant fraction of the velocity of light. Starlight indeed "bends" as it passes the space in which is contained a large mass such as a star or galaxy resulting in gravitational lensing. Mu mesons' "clocks" seem to slow down in the Earth's gravitational field as they are detected at sea level when they should have expired miles above sea level. But a pendulum clock seems to run faster as a gravity field increases, the period of which is proportional to the acceleration due to gravity. (Eq. 1), while an atomic clock runs slower in an increased gravity field. The atomic clock consistent with relativity the pendulum clock in seeming contradiction.

One current view held by Homer Tilton, the host of this conference, is that the effects of relativity seem to be what they are because the moving objects are not free of the inertial frame in which they are moving. They

somehow “drag” the frame with them and the result of the “dragging” manifests itself as the relativistic effects we so readily have been measuring. According to Tilton if the moving object is being propelled by its own onboard engine and fuel supply then the object would be free from the relativistic effects and, for example, the inertial increase would not be “felt” by the moving object thus it can move faster than light. (Fig. 1)

Can a simple experiment, in concept, be done to show if this is case? I think so. We must make many assumptions about what relativity says about kinetic energy. However, we will simple state that the kinetic energy is as stated in Eq. 2. If the effect of increasing inertia (mass) is real the object’s kinetic energy will increase as it moves faster because its relativistic mass is increasing and the effect felt would be that the object becomes “harder to push”. If the effect of increasing inertia is not real then the object’s kinetic energy is what it is for a given mass and velocity of the object no matter what velocity it has. The velocity is free to increase without limit and the effect of being “harder to push” will not be felt. If Tilton is correct then the kinetic energy of the object will increase because of the increased velocity of the object. If Einstein is correct then the kinetic energy will increase because of the increased velocity of the object as well as its increasing inertia

I think Tilton is on to something but not in making an object move faster and faster to exceed the speed of light. I think his idea of the “dragging” of space is an indication that we need to find a way to distort space as a mass does and thus “shorten” the distances between points. That will have the effect of moving faster than the speed of light.

Thank you.

David G. Iadevaia

18 February 2005

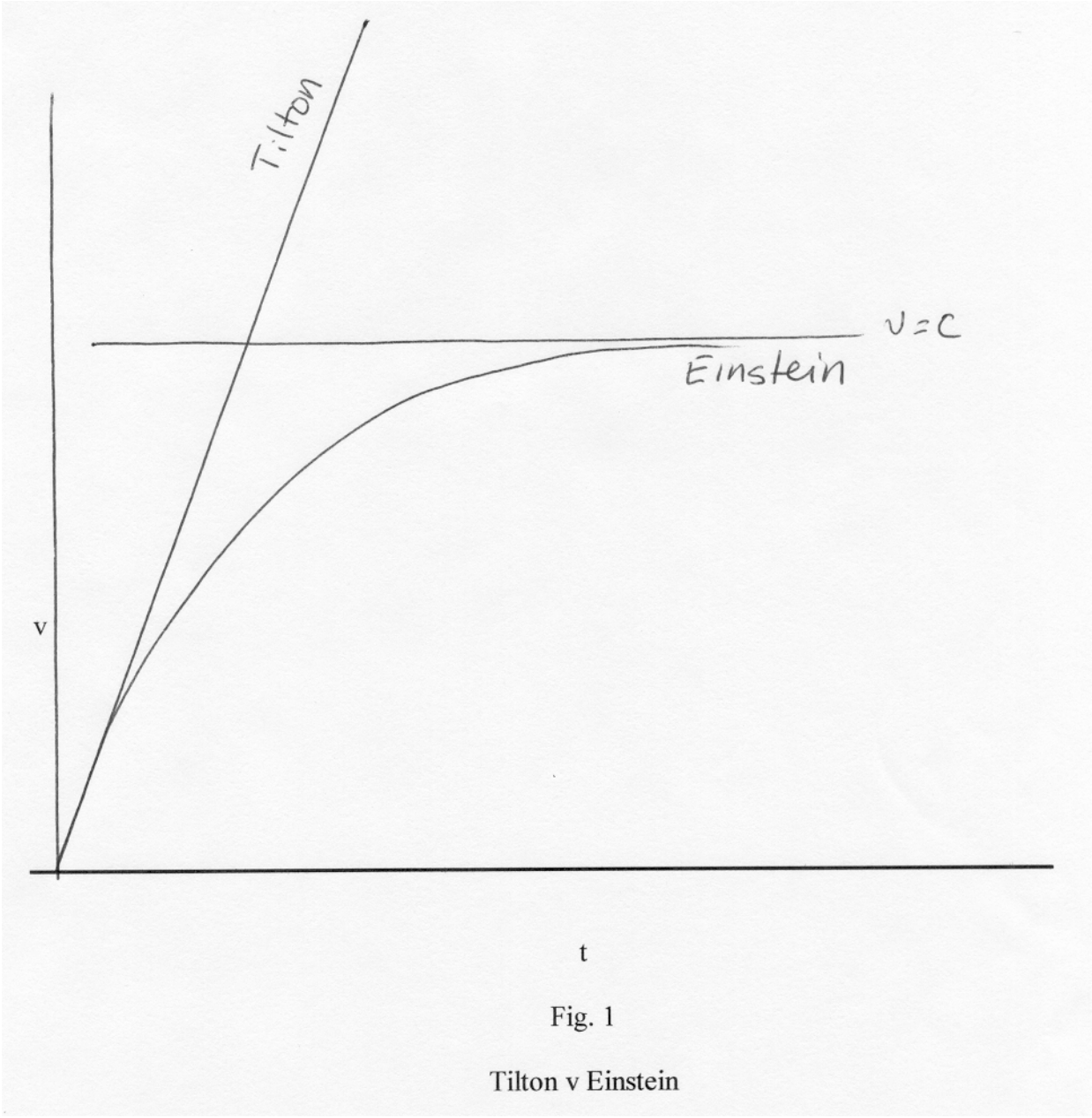

Fig. 1

Tilton v Einstein

$$T = 2(Pi)SQR\ (L/g)$$

Where:

T = the period of the pendulum
L = the length of the pendulum
g = the acceleration due to gravity

Eq. 1

$$KE = \tfrac{1}{2}\, m((v)(v))$$

Where:

KE = kinetic energy of the object
m = mass of the object
v = velocity of the object

Eq. 2

On the Possibility of Instant Displacements in the Space-Time of General Relativity[1]

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Abstract: Employing the mathematical apparatus of chronometric invariants (physical observable quantities), this study founds a theoretical possibility to displace particle instantly in the space-time of the General Theory of Relativity.

On the Possibility of Instant Displacements in the Space-Time of General Relativity

1. The teleportation condition in General Relativity

As it is known, the basic space-time of the General Theory of Relativity is a four-dimensional pseudo-Riemannian space, which is, in general, inhomogeneous, curved, rotating, and deformed. There the square of the space-time interval $ds^2 = g_{\alpha\beta}dx^\alpha dx^\beta$, being expressed in the terms of physical observable quantities — chronometric invariants [1, 2], takes the form

$$ds^2 = c^2 d\tau^2 - d\sigma^2.$$

Here the quantity

$$d\tau = \left(1 - \frac{\mathrm{w}}{c^2}\right)dt - \frac{1}{c^2}v_i dx^i,$$

is an interval of physical observable time, $w = c^2\left(1 - \sqrt{g_{00}}\right)$ is gravitational potential, $v_i = -c\dfrac{g_{0i}}{\sqrt{g_{00}}}$ is the linear velocity of the space rotation, $d\sigma^2 = h_{ik}dx^i dx^k$ is the square of a spatial observable interval, $h_{ik} = -g_{ik} + \dfrac{1}{c^2}v_i v_k$ is the metric observable tensor, g_{ik} are spatial components of the

[1] Presented *in absentia* by Dr. Florentin Smarandache.

fundamental metric tensor $g_{\alpha\beta}$ (space-time indices are Greek $\alpha,\beta=0,1,2,3$, while spatial indices — Roman $i,k=1,2,3$).

Following this way we consider a particle displacing at ds in the space-time. We write ds^2 down as follows

$$ds^2=c^2d\tau^2\left(1-\frac{\mathrm{v}^2}{c^2}\right),$$

where $\mathrm{v}^2=h_{ik}\mathrm{v}^i\mathrm{v}^k$, and $\mathrm{v}^i=\frac{dx^i}{d\tau}$ is the three-dimensional observable velocity of the particle. So ds is: (1) substantial quantity under $\mathrm{v}<c$; (2) zero quantity under $\mathrm{v}=c$; (3) imaginary quantity under $\mathrm{v}>c$.

Particles of non-zero rest-masses $m_0\neq 0$ (substance) can be moved: (1) along real world-trajectories $cd\tau>d\sigma$, having real relativistic masses $m=\frac{m_0}{\sqrt{1-\mathrm{v}^2/c^2}}$; (2) along imaginary world-trajectories $cd\tau<d\sigma$, having imaginary relativistic\linebreak masses $m=\frac{im_0}{\sqrt{\mathrm{v}^2/c^2-1}}$ (tachyons). World-lines of the both kinds are known as *non-isotropic trajectories*.

Particles of zero rest-masses $m_0=0$ (massless particles), having non-zeroes relativistic masses $m\neq 0$, move along world-trajectories of zero four-dimensional lengths $cd\tau=d\sigma$ at the light velocity. They are known as *isotropic trajectories*. To massless particles are related light-like particles — quanta of electromagnetic fields (photons).

A condition under which a particle may realize an instant displacement (*teleportation*) is as equality to zero of the observable time interval $d\tau=0$ so that the *teleportation condition* is

$$\mathrm{w}+v_iu^i=c^2,$$

where $u^i=\frac{dx^i}{dt}$ is its three-dimensional coordinate velocity.

2. Teleportation of mass-bearing particles and massless particles

From here the square of that space-time interval this particle displaces instantly takes the form

$$ds^2=-d\sigma^2=-\left(1-\frac{\mathrm{w}}{c^2}\right)^2c^2dt^2+g_{ik}dx^idx^k,$$

where $1-\frac{\mathrm{w}}{c^2}=\frac{v_i u^i}{c^2}$ in this case, because of $d\tau=0$.

Actually being the signature $(+---)$ in the space-time area of a regular observer, the signature becomes $(-+++)$ in that space-time area where particles may be teleported. So the terms “time” and “three-dimensional space” change each other in that area. “Time” of teleporting particles is “space” of the regular observer, and vice versa “space” of teleporting particles is “time” of the regular observer.

At first, let us consider substantial particles. As it easy to see, instant displacements (teleportation) of such particles realize itself along world-trajectories in which $ds^2=-d\sigma^2\neq 0$ is true. So the trajectories represented in the terms of observable quantities are pure spatial lines of imaginary three-dimensional lengths $d\sigma$, although being taken in ideal world-coordinates t and x^i the trajectories are four-dimensional. In a particular case, where the space is free of rotation ($v_i=0$) or its rotation velocity v_i is orthogonal to the particle’s coordinate velocity u^i (so that $v_i u^i=|v_i||u|\cos(v_i;u^i)=0$), substantial particles may be teleported if only gravitational collapse occurs ($\mathrm{w}=c^2$). In this case world-trajectories of teleportation taken in ideal world-coordinates become also pure spatial $ds^2=g_{ik}dx^i dx^k$.

Second, massless light-like particles (photons) may be teleported along world-trajectories located in a space of the metric

$$ds^2=-d\sigma^2=-\left(1-\frac{\mathrm{w}}{c^2}\right)^2 c^2dt^2+g_{ik}dx^i dx^k=0,$$

because for photons $ds^2=0$ by definition. So the space of photon teleportation characterizes itself by the conditions $ds^2=0$ and $d\sigma^2=c^2d\tau^2=0$.

The obtained equation is like the “light cone” equation $c^2d\tau^2-d\sigma^2=0$ ($d\sigma\neq 0$, $d\tau\neq 0$), elements of which are world-trajectories of light-like particles. But, in contrast to the light cone equation the obtained equation is built by ideal world-coordinates t and x^i — no this equation in the terms of observable quantities. So teleporting photons move along trajectories which are elements of the world-cone (like the light cone) in that space-time area where substantial particles may be teleported (the metric inside that area has been obtained above).

Considering the photon teleportation cone equation from viewpoint of a regular observer, we can see that the spatial observable metric

$d\sigma^2 = h_{ik}dx^i dx^k$ becomes degenerated $h = \det\|h_{ik}\| = 0$ in the space-time area called that cone. Taking the relationship $g = -hg_{00}$ [1, 2] into account, we arrive to that the four-dimensional metric $ds^2 = g_{\alpha\beta}dx^\alpha dx^\beta$ degenerates as well $g = \det\|g_{\alpha\beta}\| = 0$ there. The last fact implies that signature conditions defining pseudo-Riemannian spaces are broken. So that photon teleportation realizes itself outside the basic space-time of the General Theory of Relativity. Such fully degenerated space was considered in [3, 4], it was referred as *zero-space* because from viewpoint of a regular observer all spatial intervals and time intervals are zeroes there.

At $d\tau = 0$ and $d\sigma = 0$ observable relativistic mass m and the frequency ω become zeroes. So from viewpoint of a regular observer all particles located in zero-space (in particular, teleporting photons) having zero rest-masses $m_0 = 0$ are looking of zero relativistic masses $m = 0$ and the frequencies $\omega = 0$. Therefore particles of such kind may be assumed the ultimate case of massless light-like particles.

We will refer to all particles located in zero-space as *zero-particles*.

In the frames of the particle-wave concept each particle is given by its own wave world-vector $K_\alpha = \dfrac{\partial\psi}{\partial x^\alpha}$, where ψ is the wave phase (eikonal). Eikonal equation $K_\alpha K^\alpha = 0$ [5], setting forth that the length of the wave vector remains unchanged*, for regular massless light-like particles (regular photons) becomes travelling wave equation

$$\frac{1}{c^2}\left(\frac{{}^*\partial\psi}{\partial t}\right)^2 + h^{ik}\frac{{}^*\partial\psi}{\partial x^i}\frac{{}^*\partial\psi}{\partial x^k} = 0,$$

that may be obtained after taking $K_\alpha K^\alpha = g^{\alpha\beta}\dfrac{\partial\psi}{\partial x^\alpha}\dfrac{\partial\psi}{\partial x^\beta} = 0$ in the terms of physical observable quantities [1, 2], where we formulate regular derivatives through chronometrically invariant (physical observable) derivatives $\dfrac{{}^*\partial}{\partial t} = \dfrac{1}{\sqrt{g_{00}}}\dfrac{\partial}{\partial t}$ and $\dfrac{{}^*\partial}{\partial x^i} = \dfrac{\partial}{\partial x^i} + \dfrac{1}{c^2}v_i\dfrac{{}^*\partial}{\partial t}$ and we use $g^{00} = \dfrac{1}{g_{00}}\left(1 - \dfrac{1}{c^2}v_i v^i\right)$, $\mathrm{v}_k = h_{ik}\mathrm{v}^i$, $v^i = -cg^{0i}\sqrt{g_{00}}$, $g^{ik} = -h^{ik}$.

* According to Levi-Civita's rule, in a Riemannian space of n dimensions the length of any n-dimensional vector remains unchanged in its parallel transfer. So it is true for the four-dimensional wave vector in a four-dimensional pseudo-Riemannian space — the basic space-time of the General Theory of Relativity. As it is well-known, because all isotropic trajectories have zero four-dimensional length, the length of any isotropic vector is zero, of the wave vector included.

Eikonal equation in zero-space takes the form

$$h^{ik}\frac{{}^{*}\partial\psi}{\partial x^{i}}\frac{{}^{*}\partial\psi}{\partial x^{k}}=0,$$

because of there is $\omega=\frac{{}^{*}\partial\psi}{\partial t}=0$ putting the equation time term into zero. It is standing wave equation. So, from viewpoint of a regular observer, in the frames of the particle-wave concept all particles located in zero-space are looking *standing light-like waves*, so that all zero-space is looking filled with a system of light-like standing waves — a light-like hologram. This implies that an experiment discovering non-quantum teleportation of photons should be linked to stop of light.

There is no problem that photon teleportation realizes itself along fully degenerated world-trajectories ($g=0$) outside the basic pseudo-Riemannian space ($g<0$), while teleportation trajectories of substantial particles are strictly non-degenerated ($g<0$) so the trajectories are located in the pseudo-Riemannian space*. It is no problem, because in any point of the pseudo-Riemannian space we can place a tangential space of $g\le 0$ consisting of the regular pseudo-Riemannian space ($g<0$) and zero-space ($g=0$) as two different areas of the same manifold. Such space of $g\le 0$ will be a natural generalization of the basic space-time of the General Theory of Relativity, permitting teleportation of both substantial particles (outside experiment yet) and photons that has been realized in experiments.

The only difference is that from viewpoint of a regular observer the square of any parallel transferred vector remains unchanged. It is an "observable truth" for also vectors in zero-space, because the observer reasons standards of his pseudo-Riemannian space anyway. So that eikonal equation in zero-space, expressed in his observable world-coordinates, is $K_{\alpha}K^{\alpha}=0$. But being taken in ideal world-coordinates t and x^{i} the metric inside zero-space $ds^{2}=-\left(1-\frac{\mathrm{w}}{c^{2}}\right)^{2}c^{2}dt^{2}+g_{ik}dx^{i}dx^{k}=0,$ degenerates into a three-dimensional $d\mu^{2}$ which, depending on gravitational potential w uncompensated by something other, is not invariant

* Any space of Riemannian geometry has the strictly non-degenerated metric by definition of such metric spaces. Pseudo-Riemannian spaces are a particular case of Riemannian spaces, where the metric is sign-alternating. So a four-dimensional pseudo-Riemannian space Einstein put the base of the General Theory of Relativity is as well of strictly non-degenerated metric.

$d\mu^2 = g_{ik}dx^i dx^k = \left(1-\frac{\mathrm{w}}{c^2}\right)^2 c^2 dt^2 \neq \mathrm{inv}$. As a result, within zero-space the square of a transferred vector, a four-dimensional coordinate velocity vector U^α for instance, being degenerated into a three-dimensional U^i, does not remain unchanged

$$U_i U^k = g_{ik}U^i U^k = \left(1-\frac{\mathrm{w}}{c^2}\right)^2 c^2 \neq \mathrm{const},$$

so that looking Riemannian geometry for a regular observer, the real geometry of zero-space within the space itself is non-Riemannian one.

3. Conclusions

Finishing this brief study, we conclude that instant displacements of particles are naturally permitted in the space-time of the General Theory of Relativity. As it was shown, teleportation of substantial particles and photons realizes itself in different space-time areas. But it would be a mistake to think that teleportation requires to accelerate a substantial particle to super-light speeds (the tachyons area), while a photon needs to be accelerated to infinite speed. No — as it is easy to see from the teleportation condition $\mathrm{w} + v_i u^i = c^2$, if gravitational potential is essential and the space rotates at a speed close to the light velocity, substantial particles may be teleported at regular sub-light speeds. Photons can reach the teleportation condition easier, because they move at the light velocity. From viewpoint of a regular observer, as soon as the teleportation condition realize itself in the neighbourhood around a moving particle, such particle “disappears” although it continues its motion at a sub-light coordinate velocity u^i (or at the velocity of light) in another space-time area invisible for us. Then, having its velocity lowered or something other that breaks the teleportation condition (lowering gravitational potential or the space rotation speed), it “appears” in the same observable moment in another point of our observable space at that distance and the direction which it has got at u^i there.

In connection with the results, it would be good to remember the “Infinity Relativity Principle”, introduced by Abraham Zelmanov (1913–1987), a prominent cosmologist. Having his cosmological studies [1] a base, he had arrived to that “…in homogeneous isotropic cosmological

models spatial infinity of the Universe depends on our choice of that reference frame from which we observe the Universe (the observer's reference frame). If the three-dimensional space of the Universe, being observed in one reference frame, is infinite, it may be finite in another reference frame. The same is as well true for the time during which the Universe evolves."

We have arrived to the "finiteness relativity" here. As it was shown, because of a difference between physical observable world-coordinates and ideal ones, the same space-time areas may be very different, being defined in each of the frames. So that, being taken in observable world-coordinates zero-space is a point ($d\tau = 0$, $d\sigma = 0$), while $d\tau = 0$ and $d\sigma = 0$ taken in ideal world-coordinates become $-\left(1-\frac{\mathrm{w}}{c^2}\right)^2 c^2 dt^2 + g_{ik} dx^i dx^k = 0$ that is a four-dimensional cone equation like the light cone. Actually here is the "finiteness relativity" for observed objects — an observed point is the whole space taken in ideal coordinates.

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A Hypothesis: There is no Speed Barrier in the Universe

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Abstract: In this short paper, as an extension and consequence of the Einstein-Podolski-Rosen paradox and Bell's inequality, one promotes the hypothesis that: There is no speed barrier in the universe and one can construct arbitrary speeds, and also one asks if it's possible to have an infinite speed (instantaneous transmission).

Future research: to study the composition of faster-than-light velocities and find what happens with the laws of physics at faster-than-light velocities.

1. Introduction:

What's new in science (physics)?

According to researchers from the common group of the University of Innsbruck in Austria and US National Institute of Standards and Technology (starting from December 1997, Rainer Blatt, David Wineland et al.):

- photon is a bit of light, the quantum of electromagnetic radiation (quantum is the smallest amount of energy that a system can gain or lose);
- polarization refers to the direction and characteristics of the light wave vibration;
- if one uses the entanglement phenomenon, in order to transfer the polarization between two photons, then: whatever happens to one is the opposite of what happens to the other; hence, their polarizations are opposite of each other;

- in quantum mechanics, objects such as subatomic particles do not have specific, fixed characteristic at any given instant in time until they are measured;
- suppose a certain physical process produces a pair of entangled particles A and B (having opposite or complementary characteristics), which fly off into space in the opposite direction and, when they are billions of miles apart, one measures particle A; because B is the opposite, the act of measuring A instantaneously tells B what to be; therefore those instructions would somehow have to travel between A and B faster than the speed of light; hence, one can extend the Einstein-Podolsky-Rosen paradox and Bell's inequality and assert that the light speed is not a speed barrier in the universe.

Such results were also obtained by: Nicolas Gisin at the University of Geneva, Switzerland, who successfully teleported quantum bits, or qubits, between two labs over 2 km of coiled, cable. But the actual distance between the two labs was about 55m;
researchers from the University of Vienna and the Austrian Academy of Science (Rupert Ursin et al. have carried out successful teleportation with particles of light over a distance of 600m across the River Danube in Austria); researchers from Australia
National University and many others.

2. **Scientific Hypothesis**:

We even promote the hypothesis that: there is no speed barrier in the universe, which would theoretically be proved by increasing, in the previous example, the distance between particles A and B as much as the universe allows it, and then measuring particle A.

3. **An Open Question** now:

If the space is infinite, is the maximum speed infinite?

> "This Smarandache hypothesis is controversially interpreted by scientists. Some say that it violates the theory of relativity and the principle of causality, others support the ideas that this hypothesis works for particles with no mass or imaginary mass, in non-locality, through tunneling effect, or in other (extra-)dimension(s)." [Kamla John]

Scott Owens' answer to Hans Gunter in an e-mail from January 22, 2001 (the last one forwarded it to the author): "It appears that the only things the Smarandache hypothesis can be applied to are entities that do not have real mass or energy or information. The best example I can come up with is the difference between the wavefront velocity of a photon and the phase velocity. It is common for the phase velocity to exceed the wavefront velocity, c, but that does not mean that any real energy is traveling faster than *c*. So, while it is possible to construct arbitrary speeds from zero in infinite, the superluminal speeds can only apply to purely imaginary entities or components."

Would it be possible to accelerate a photon (or another particle traveling at, say, 0.99c and thus to get speed greater than c (where c is the speed of light)?

Future possible research.
It would be interesting to study the composition of two velocities v and w in the cases when:

$v < c$ and $w = c$.
$v = c$ and $w = c$.
$v > c$ and $w = c$.
$v > c$ and $w > c$.
$v < c$ and $w = \infty$.
$v = c$ and $w = \infty$.
$v > c$ and $w = \infty$.
$v = \infty$ and $w = \infty$.

What happens with the laws of physics in each of these cases?

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[An early version, based on a 1972 paper, was presented at the Universidad de Blumenau, Brazil, May-June 1993, in a Tour Conference on "Paradoxism in Literature and Science"; and at the University of Kishinev, in a Scientific Conference chaired by Professors Gheorghe Ciocan, Ion Goian, and Vasile Marin, in December 1994.]

A New Physical Theory Explains the Structure of Light in a Dimensional Hierarchy of Metric Spaces and How the Speed of Light Can Be Changed

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Abstract

Space-forms that model material, material interactions, and the structure of metric spaces; such that all these space-form structures exist within a dimensional hierarchy of metric spaces and together they form the base space of a principle fiber bundle so that a new model of a vacuum can be created within the fiber group, is the basic structure of a new way to use language such that the new language is better suited for describing the verifiable patterns of the physical world. The new patterns described, allow many difficult questions about physical law to be resolved, such as how to go faster than the speed of light, and a new way get energy from radioactive material.

Introduction

It is desirous to find a description of the physical world which actually describes the patterns that are observed so that such a description would provide the most help in figuring out how, to use material to help civilization the most, while at the same time keeping in mind the ideas of conservation, protecting the environment, and keeping costs down. In order to obtain a description of the physical world which actually describes the patterns that are observed, the language of the description must be continually altered. Godel's completeness theorem plainly states that a fixed language can only describe a limited number of patterns. There should be many attempts at trying to find alternative ways in which to use language in order to find new ways to describe the patterns of the physical world.

However, the institutions of man seem to want the language to stay fixed, so that the mythological contest of finding "the best' will continue. This of course is needed so that man will continue to have confidence that his institutions are being guided by the mentally coercive notion of "excellence." Unfortunately such a search for "excellence" within such a narrow dogmatic so of guidelines is bad for science itself.

The current theories of string-M theory and the theory of the big bang simply use logically inconsistent language. Namely, one cannot introduce geometry into a probability theory, because a probability theory has the uncertainty principle, which in turn destroys local geometry. Furthermore, quantum field theory (QFT) is a linear theory which is being used to describe non- linear data. Namely, the particle tracks that are used to verify QFT do not show definite similar patterns of particle tracks from verifying picture to verifying picture. This is a sign of a non- linear system.

There are many physical systems whose descriptions are quite inadequate when described in terms of the current fixed language that is being used. Namely:

1. The nucleus
2. Atoms with high atomic numbers
3. Molecules and molecular shape.
4. Crystals, For example, as the limit of making the smallest possible electronic components on chips apparently is being approached, the currently accepted physical description is not coming up with descriptions of micro-interactions, that can be used that might give a way to engineer around this barrier.
5. Superconductivity (the high temperature cut off of the BSC theory was surpassed by new high temperature phenomenon, hence BSC is wrong)
6. A model for micro-system interactions, regular QM is failing (and QFT fails miserably) at this.
7. A believable model of a living system which accounts for how quickly life formed after the earth cooled, i.e. within 150 million years. This new theory also gives a physical basis for a model of a mind, or more generally for a model of mental systems.
8. Solar system stability

9. What the sun's energy source really is, the neutrinos detected are not the type predicted, and the machinations of a probability based theory to explain this discrepancy are not believable. Namely, since electrons do not mutate into other families of the three families to which electrons belong, as it is claimed that neutrinos do mutate to the other families.
10. Dark material of galaxies and other systems.
    This list contains elementary, fundamental physical systems that go without adequate description. No wonder the promises of great technological advances are never realized.

The ranking of physical theories by me:

1. Newtonian mechanics and Hamiltonian mechanics, good theories and essentially Galilean invariant, though Hamiltonian methods can be adapted to other coordinate systems.
2. Maxwell's equations and Special Relativity are invariant with respect to the space-time metric, and relativity gives the identification of (xy, zt) with (p(x), p(y), p(z),E) which leads to the idea that mass equals energy.
3. Thermodynamics and statistical physics are at about the same level of value as theories I and 2 above, that is, they work fairly well for a fairly large range of physical phenomenon.
4. Quantum Mechanics (QM) gives solutions to the H-atom and to other ideal potentials so as to give one the idea that, physical systems that are constrained in some way by geometric boundary conditions will have natural structures of energy levels. But the whole theory is very inadequate, degenerating into the density functional method which is mostly an experimental method for finding ground states of physical systems.
5. Ed Nelson derived QM from atomic material's local dynamics of the random walk. This new theory also describes the local dynamics of an atom as a random walk. Brownian motion can be used as physical evidence in favor of a space-form model of the local dynamics of atoms.

6. It is often stated that no known measurement has ever contradicted QM, but QM is a probability based theory, so this statement might be best compared to the idea that if Ptolemy's theory were still the currently accepted paradigm, then I am sure it could also still be stated, that there have been no observations which have yet contradicted it. Micro-systems need a description, however, theories based in probability may not be the best language to use in order to describe these micro-systems. This is because within a probabilistic framework the goal is to fit data, so equations are altered until solutions are found which fit the data. The physical properties that are believed to guide the system are usually of limited value.
7. General Relativity is a nice idea, but it has only been solved for a I - body, spherically symmetric problem, so it has very limited application. In particular it casts no new light on solar system stability.
8. Non-linear theory is not understood, and complexity theory has pretty suspicious boundary conditions that it uses, most often without justification. Namely, boundary conditions that have a lot of unjustified order to them. Again, in non-linear theory, equations and boundary conditions are adjusted until solutions are found which **fit** the data, this is done in a manner similar to the above probability based theories.

The theories of numbers 1, 2, and 3 are the best theories of the currently accepted paradigm, and they are not describing many of the patterns that are being seen at both the micro and macro level. The other theories of the currently accepted paradigm, I would classify as speculation, and not particularly good speculation at that. This new theory gives a better way to describe microscopic phenomenon than quantum theories and it is consistent with theories 1, 2, and 3, while it also explains, via Ed Nelson's ideas, why quantum mechanics has some validity.

It might be, that with adequate understanding of what causes the stability of so many fundamental physical systems, as the theory proposed here allows such an understanding, then non-linearity might also be better understood, and be of some use. As it is now, the uses of non- linearity in physical description has the limitations that any guessing game, i.e. probability based theory, would have.

The world of physical theory now, more than ever, needs to explore new language bases, so as to find new physical descriptions that have more, value in their ability to describe the patterns that do exist (for example, the ten physical systems or mysteries listed above need a valid description) than does the currently accepted paradigm's ability to describe such physical patterns and physical systems. A description that is actually accurate might lend itself more readily to much needed system control, sense our civilization is in need of (amongst other capabilities) a cheap energy source.

It must be stated that the ideas presented here carry with them an obligation which is intended by the originator of these ideas. Namely, that they not be used for destructive or selfish purposes. These ideas place people in their true context, and that context is not dominated by materialism and selfish intentions that materialism implies. Namely controlling people by controlling material or by controlling what one thinks one knows about the world. Rather that true context of people's existence is about people's creative relation to existence, not their selfish interests in a context of a fixed notion about material.

The dimensional structure of the physical world and its relation to the speed of light

The material of the world has an apparent hierarchy based on the size of orbital structures. Nuclei, atoms, molecules, and crystals have an orbital or energy structure that depends on vibrations or waves, apparently trapped in a potential, while planets, moons, stars, galaxies supposedly depend on gravity for their orbital structure. It must be noted that the stability of planetary orbits, and motions of stars in galaxies have not been accounted for. There are new ideas about how to describe these systems. In these new ideas, these orbital structures depend on geometric shapes, local curvature (the equivalent of a potential), and natural vibrations on the ("new') geometric shapes. These new ideas can account for many properties of what are elementary physical systems which the currently accepted paradigm cannot account for, (see list in the introduction).

In the new way of describing the world, things (material objects) exist in a dimensional hierarchy of metric spaces so that there are at least two different types of material, each with its own metric space structure.

These two types of material together compose physical systems, at least in three dimensions and less. These two material types are the massive (or inertial) material, that we see, and the charged, very stable material, that we do not see directly (ether or ethereal bodies). Apparently it has recently been found that calculations in celestial mechanics are more success in the Galilean frame than in the space-time frame.

Materials, interactions between materials, and metric spaces all depend on the (spectral) geometric shapes which exist in a dimensional hierarchy of metric spaces. These geometric shapes are the natural spectral structures of metric spaces called space-forms. Space-forms come from moding out (identifying opposite sides of the lattice's fundamental domain) discrete isometry (metric preserving transformations) subgroup's lattice structure. (Mathematically, space-forms are defined on spaces of constant curvature). The spectrum of hyperbolic space-forms is composed of a set of distinguished flows on the space-form. Each flow has a definite physical state associated to it. When considering metric states in Euclidean space it is Newton's rotating bucket that is the unresolved paradox which necessitates the fundamental lowest dimensional two state properties of spin representations in Euclidean space. That is, in one such spin state the distant stars are fixed, and in the other metric state the distant stars are rotating. These two metric states distinguish matter from anti-matter in Euclidean space.

Dynamical interactions between material depend on incremental changes in time states (each metric space has two physical states, this is the basis for spin representations) along with local curvature which together cause displacements of massive material in the inertial space where each change of time state is due to incremental spin rotations, which are rotations between space-form flows. Rotation between these flows is needed to define the spectral shapes, within a Hermitian space setting. These flows (in hyperbolic space) are the space-form's actual spectrum. The displacements of a mass's position, due to interactions, can be related to solutions to differential equations which depend on the Dirac operator. Boundary conditions for the differential equations are based on this very geometric setting of space-forms in Hermitian space.

The two metric states of hyperbolic space are positive and negative time, that is, time moving in two opposite directions. Positive time is associated with charge while negative time is associated with monopoles.

Material and interacting physical systems have natural internal state structure based in the flows of space- forms, and the flow's relation to metric-state properties. Again solutions to differential equations based on the Dirac operator yield the internal energy level (properties) of these material space-forms. However, the model is much more geometric than all previous theories. The description of physical systems made of mass and charge along with the containing (metric) spaces depend on solutions to metric invariant differential equations, such as the Dirac-like or Laplace-like operators, as well as depending on a dimensional hierarchy.

The spectral structure of space-forms give an alternative context with which to view the function spaces on which differential operators act, and from which solutions are found. Function spaces have shown themselves to be much too large as spaces, so that the function space's spectral properties do not give any organizational structure to the spectra. This means that the function space's relation to the description of physical systems is given in terms of the overly broad context of probability. On the other hand, space-forms constrain spectral properties, and give the spectra an organizational structure. Namely, a dimensional hierarchy of space-forms, so that each of space-form dominates, by means of resonance, the spectral structure of the lower dimensional space-forms that it contains.

Light emerges from interaction space-forms associated to stable material, charged systems, so that the interaction is at the site of a charge which changes the state that it occupies. It emerges as an infinite extent, 7-dimensional (interaction, hence neutral) space-form (which, because it is neutral, is always an interaction face) that originates from the 3-dimensional interaction space-form. Light is an infinite extent space-form structure which carries energy as a vibration which moves along its infinite extent space-form. Within a metric space of a fixed dimension, the speed of light is fixed due to an apparent resonance with space, and the infinite extent spatial structure of light. Outside that fixed dimensional metric space, the speed of light loses its natural constraints. (see below)

One important property of the space-forms in the dimensional hierarchy of metric spaces is that some of the odd dimensional space-forms

have a natural energy generating oscillation associated to themselves. This is important in determining the spectral properties of higher dimensional, coherent, physical and spectral systems. The coherence of such systems depends on a new vacuum in the space's fiber group.

In each dimensional metric space, there exist material space-forms along with dynamics and new material systems created by interactions, and a varied metric space structure [either space-form or flows]. The properties of the space-forms change (subtly and abruptly) from dimension to dimension in the hierarchy. Any particular fixed dimension metric space, filters out higher dimensional space-form properties, as well as higher dimensional metric space properties. The basic physical structure in hyperbolic space, i.e. space-time, are as follows:

Material
n-dimensional space-form Positive and negative "charge"
manifests as (n-1)-dimensional spectral flows on the space-form

Interactions
(n+l)-dimensional space-form Neutral spatial faces help
create new material and provide curvature which
directs a dynamical interaction's spatial displacement.
Neutron and neutrino like structures compose the neutral spatial "face"

Metric Space
(n+l)-dimensional Either a Space-form: Contains
material created by the interactions in the metric space
OR a Flow on a space-form:
Except for the first level, these are orbits of large
scale systems such as a planet or a star, hence
such a metric space is all encompassing and it
also contains both the material space-forms and
the material created by interactions as well
as dynamics of material systems

The positively and negatively charged (material) space-forms occupy the metric states of higher dimensional space-forms. The charged space-

forms create both the positively charged nucleus and the negatively charged electron clouds respectively. These opposite charges are held together by a 3- dimensional interaction space-form. The nucleus is a closed and bounded space-form, which means its position in space can be very well defined. The electron cloud circulates about the nucleus so that the electron cloud's neutral constituents, i.e. the neutrinos, form into infinite extent parts of the electron cloud's space-form. These infinite extent parts of the electron cloud, facilitate interaction processes with "distant' atomic neighbors. Furthermore, their infinite extent provide the non-local mechanism through which light's interaction space-form structure can form. Light's interaction space-form provides the means by which energetic changes in the micro-system, eg an atom, can be coupled to other similar changes in energy state occupancies that happen at distant micro-systems. This means that light and the neutral part of the electron cloud together create a mechanism for interactive changes of charge occupation between material's internal states.

The dynamical interaction space-forms connect together material separated by space, and with each spin change in time (or change in inertial state) the local curvature and the mixing of time states (which are determined by local space-form properties) cause the materials that are connected together by the interaction space-forms, to displace in the displacement space, i.e. Euclidean space (the space of inertia). With each displacement process a new interaction space-form is created instantaneously, this is easy to understand since the material is already present as well as the spatial relations. Interaction space-forms can also be about connecting, not material but rather, spatial faces (that represent interacting systems) together. In this case the interaction space-form could change smoothly in a coordinate space continuum, analogous to a smooth system described by kinetic and potential energy terms.

These "spatial face" interaction space-forms carry information about the geometry of material in space. Such space-forms could be stored and interconnected, so as to model a mind and its relation to the world's geometry. Understanding how to connect such (space-form) information is closely related to a model of a mind and also to the "voice of intent." Correct knowledge can facilitate wide ranging creative processes and

(spectral) transformations, related to the dimensional hierarchy, which humans are capable of controlling through acts of will (or "intent").

The natural storing place of this spectral representation of the world, is within a fiber group which is related to a new model of the vacuum. Namely, the vacuum is the set of all spectral possibilities which exist on a maximal torus that is within a fiber group (which exists above each point of the space), so that the spectra on the maximal torus are in resonance with the dimensional spectral hierarchy of the space-forms that determine the metric space and the sum (or union) of all the material that make up (or are contained in) that metric space. The spectral shapes that carry the geometric information of material in metric spaces, ie the interaction space-forms, can be stored on the maximal torus in the fiber group that exists above each point in the space. Making this information available to a mind can be done through resonance relations, along with a process of connecting these spectral (actual space-form) representations of the material world's geometry (through interaction space-forms) together for the processes that are needed to model a mind. Similar processes are the means through which intent is formulated (or determined).

Consider an (n+ I)-dimensional metric space, when (n+ 1) is an even number, then because waves have no well defined propagation speed in an even dimensional metric space, the speed of light in this even dimensional metric space, C_e, has the property that, $C_e \leq C_o$, where C_o, is the constant speed of light on any odd dimension metric space. If this is the case, then

Either $\Delta A - \frac{1}{c_e^2}\frac{\partial^2 A}{\partial t^2} = j$ (where Δ, is the Euclidean Laplacian) has a variable

propagation speed, C_e, in which case it is no longer the wave equation (this would mean that electromagnetism would not exist), OR the solution has both advanced and retarded potential terms which compose it. A solution with advanced and retarded terms would imply, amongst other things, that spin rotation, being related to the magnetic field, B, would have varying directions of (spin) rotation due to the advanced and retarded term. This would cause dynamics to take the form of a random walk. Hence, for even dimensional metric spaces; time, wave propagation, and material dynamics are not well defined.

The proper, but surprising, conclusion is that material systems in an even dimensional metric space must have their dynamics controlled by the mental systems described above. Hence, even dimensional metric spaces have mental systems along with material systems, that can have definitive dynamics and definitive order, only if they are being controlled mentally. One of the amazing things in our lives is that our will can affect material motion, ie our ability to move.

Some odd dimensional space-forms can oscillate and generate their own energy. Such space-forms can help form life and a mind. Evolution, the development of more complicated material systems, can be seen as equivalent to the intention of existence to know and create. That is, the energy generating oscillating space- forms (in the dimensional hierarchy of metric spaces) in the base space of a principle fiber bundle, whose fiber group can be used to store the spectral information of material geometry, [(or other organized structures) [that the base space naturally makes in the form of interaction space-forms] [so that, in turn, the energy generating spectrally diverse space-forms]] can form the new (physical or mental) systems that use interaction space-forms to connect together different spectral forms of either geometry or geometric information, thus creating new space-forms, new geometries and new ideas about new space-form geometries. This is the basis of the process of evolution, a process of knowing and creating.

It turns out that odd dimensional space-forms are contained in even dimensional metric spaces, where neither time nor dynamics are well defined, so complicated living material systems in these even dimensional metric spaces can be controlled by mental systems of organization.

In odd-dimensional metric spaces, the property of time is well defined, dynamics of material exists, and light propagates as spherical waves. This means that material can have very stable geometric properties which can be seen. It is this stable, perceivable material geometry that much of our mental processes are built upon. In the even dimensional metric spaces; time and dynamics are not well defined and furthermore, the material space-forms are odd dimensional which means that they can oscillate and generate their own energy thus creating life forms and a center for mental activity.

The dimensional hierarchy of material and (the material of) living systems contained in the different dimension metric spaces which contain these space-form systems is as follows:

Material
1 -dimensional space-form
Positive and negative "charge"

Interactions
2-dimensional space-form Neutrons and neutrinos compose the neutral spatial face

Metric Space
2-dimensional
Space-form:
Nuclei, and electron clouds
Flow on a space-form:
Either a planetary orbit or a two dimensional flow on a
3-dimensional space-form
Material 2-dimensional space-form
Positive and negative "charge" manifests as
1 -dimensional spectral flows on the space-form
The 2-dimensional space-forms are nuclei and electron clouds

Interactions
3-dimensional space-form
Neutral spatial faces help create new material
Which includes plasmas, atoms, molecules, and crystals
Neutrons and neutrinos compose the neutral spatial face
Some atoms (or nuclei) can be radioactive
since they interact with a 3-dimensional
space-forms which can be oscillating

Metric Space
3-dimensional Space-form:
Atoms, molecules, crystals

Flow on a space-form:
Orbit of a planet or star

Material
3-dimensional space-form
Positive and negative "charge" manifests as
2-dimensional spectral flows on the space-form
The 3-dimensional space-forms are like nuclei and electron clouds
And are complicated material systems built from atoms, molecules etc

Interactions
4-dimensional space-form
Neutral spatial faces help create new material
Which includes life forms and mental structures
Neutron and neutrino analogs compose the neutral spatial face.
These complicated material systems are alive or
can form mental systems since they are formed
with 3-dimensional space-forms which can be oscillating

Metric Space
4-dimensional
Space-form: Life and minds
Flow on a space-form:
Orbit of a star

Material
4-dimensional space-form
Positive and negative "charge" manifests as
3-dimensional spectral flows on the space-form (which can oscillate)
The 4-dimensional space-forms
are like nuclei and electron clouds
composed of living and mental systems

Interactions
5-dimensional space-form
Neutral spatial faces help create new material

Which includes moons, planets, stars, galaxies, and the
universe Neutron and neutrino like
4-dimensional space-forms compose the neutral spatial face
Some galaxies (or stars) can alive (similar to radioactivity)
since they interact with a
5-dimensional space-forms which can be oscillating

Inner planets (along with moons), and the star itself
behave like the nuclei of an atom Asteroids,
outer planets (along with moons), comets and
Ort cloud behave Me the electron cloud

Metric Space
5-dimensional Space-form:
Moons, planets, stars, galaxies
Flow on a space-form: Orbit of a universe

The 4-dimensional space-forms which are defining planets, stars, and galaxies, have 3-dhnensional flows (or faces) which define the orbits of the galaxies, stars, planets, and moons. The orbiting material structures have 3-dimensional space-form structures that can be conveyed by the space-forms of its 2-dimensional flows (or faces). Metric spaces of dimension three or lower have the property of spherical symmetry. This means that if the mass that is contained within the orbital geometry of a 2-dimensional space-form, ie. 3- dimensions, is sufficiently large, then spherical bodies will form within these orbital flows, otherwise rings will form. The 4-dimensional material space-forms have both the nuclear and electron cloud type structures which could distinguish between the inner and outer planets, a star and its companion Ort cloud, etc.

From the 6-dimensional metric spaces up to the final 10-dimensional (ultimate) containing metric space, it is very difficult to understand the nature of both the material and the living or mental systems that are contained in these metric spaces. This is because of two things, (1) it is very difficult to consider higher dimensions, and (2) Metric spaces which are of dimension seven and higher are all defined on infinite extent flows on space-forms, so that these infinite extent metric space flows are filled

with material whose space-forms are also of infinite extent, hence, material does not have a well defined position in these spaces.

Material
5-dmensional space-form
Positive and negative "charge" manifests as
4-dimensional spectral flows on the space-form
The 5-dimensional space-forms are like nuclei and
electron clouds and are complicated material
systems built from stars and the complicated
mental structures which underlie the
material composition of the stars

Interactions
6-dimensional space-form
(apparently hyperbolic space-forms of
6-dimensions and higher are all of infinite extent)
Neutral spatial faces help create new material
Which includes life forms and mental structures
Neutron and neutrino analogs compose the neutral spatial face.
These complicated material systems are alive or
can form mental systems since they are formed with
5-dimensional space-forms which can be oscillating

Metric Space
6-dimensional Space-form:
Life and minds of this higher dimension
Flow on a space-form:
Orbit of a something beyond the universe

This 6-dimensional living system could be the life form structure which defines human life.

Unfortunately people seldom realize this (dimensional) level of intending (or mental power) in their lives because they are hooked to the material world that exists in a 3-dimensional metric space. They are hooked through their sensual energies. These sensual energies are centered

in the 4-dimensional metric space which contains the 3-dimensional material life forms. These 3-dimensional material life forms are also part of the composition of the human life form, but the human life form also has higher dimensional and hence more spectral variety in its composition. [To get the power to intend and create at the (higher dimensional) level that people are actually capable of doing, because it is really what their actual physical and living structure allows, people need to store energy. This means to pull energy away from the lower dimensional world that dominates their attention. In order to get to this higher dimensional level people need to shift their attention away from their sensual energies, up to their more abstract throat center. The throat center, also the decision spot, and is a bridge between knowledge and the ability to selflessly create, ie the voice of intent.]

To intend is to have the desire to create, or a desire to cause some process to occur, such as people interacting, or world peace, or protecting and using the environment to best effect for all, or creating a clean cheap energy supply, or helping people understand their place in existence in terms of a verifiable description. [The real art work of man is their creative relation to the universe that they have with the universe at infinite, ie after their deaths.1

Material
6-dimensional space-form
Positive and negative "charge" manifests as
5-dimensional spectral flows on the space-form
The 6-dimensional space-forms are like
nuclei and electron clouds composed of
living and mental systems

Interactions
7-dimensional space-form
Neutral spatial faces help create new material
Which includes material unknown that has
no definite position neutron and neutrino
like space-forms compose the neutral spatial face
Some material (or nuclei) can be alive since they interact with a

7-dimensional space-forms which can be oscillating

Metric Space
7-dimensional Space-form:
Material unknown with no definite position in space
Flow on a space-form: Orbit of an unknown

The power of human life to know and to intend and selflessly create could actually, ie in reality, be defined by the life structure in an 8-dimensional metric space.

Material
7-dimensional space-form
Positive and negative "charge" manifests as
6-dimensional spectral flows on the space-form
The 7-dimensional space-forms are like nuclei and electron clouds

Interactions
8-dimensional space-form
Neutral spatial faces help create new material
Which includes living and mental systems that are unknown
Neutron and neutrino like space-forms compose the neutral spatial face
Some material (or nuclei) can be alive since they interact with a
7-dimensional space-forms which can be oscillating

Metric Space
8-dimensional Space-form:
Living and mental systems unknown
Flow on a space-form:
Orbit of an unknown

Material
8-dimensional space-form
Positive and negative "charge" manifests as
7-dimensional spectral flows on the space-form
The 8-dimensional space-forms are like nuclei and electron clouds
Interactions
9-dimensional space-form
Neutral spatial faces help create new material
Which includes material unknown, that has no definite position in space
Neutron and neutrino like space-forms compose the neutral spatial face
Some material (or nuclei) can be alive since they interact with a
9-dimensional space-forms which can be oscillating

Metric Space
9-dimensional Space-form:
Material unknown
Flow on a space-form:
Orbit of an unknown

Material
9-dimensional space-form
Positive and negative "charge" manifests as
8-dimensional spectral flows on the space-form
The 9-dimensional space-forms are like nuclei and electron clouds
of life forms and mental systems

Interactions 10-dimensional hyperbolic space-form do not exist because
there are no 10-dimensional hyperbolic space-forms

Metric Space 10-dimensional hyperbolic metric space
(end of dimensional hierarchy)

A 10-dimensional hyperbolic space is an 11-dimensional space-time. The dimensional hierarchy of hyperbolic metric spaces ends at dimension ten because discrete isometry subgroups do not exist in hyperbolic metric spaces whose dimension is greater than or equal to ten. These ideas are

based on the properties of triangular hyperbolic reflection groups that H M S Coxeter espoused. This means that the manifolds of physical description can all be triangulated. This property is also related to a manifold's property of smoothness.

The mental activity of an even dimensional metric space, of say dimension, n, depends on the geometry of the material that is in the (n-1)-dimensional metric space. However, the geometry of lower dimensional metric spaces that contain material, i.e. odd dimensional metric spaces, depend on the spectra of the entire spectral structure (or space-form structure) they are contained within.

It might be noted that influencing material or mental states of a lower dimensional level, by the material within a higher (even) dimensional metric space could be quite effective.

For a life form to be contained within a spectral structure means that the spectra of the containing space- form and the spectra of the life form are in resonance. If another spectral point of reference within the life form itself, is selected by the life form this would result in also changing the external containing space-form of that life form. That is, the spectral structure of a life from can be a lot more complicated than both the spectral structure of that life form's containing metric space, and this metric space's subsequent containing spectral structure (or containing space-form).

A metric space which contains material is contained within some (ultimate) spectral structure (ie a higher dimensional containing space-form) that is oscillating and generating energy that is used to establish resonance with the space-forms that it contains. This ultimate spectral structure includes the space-form structure of the metric space which contains the material geometry. Thus there is a hierarchy of energy generating spectral shapes (all ultimately within some huge spectral structure of dimension nine contained in a ten dimensional [hyperbolic] metric space) which can determine a spectral and material reality contained in a metric space. Such a reality is contained in an energy generating spectral shape which itself could be contained in a greater containing space-form. This nesting of energy generating space-forms is the basis for a local spectral structure. This could be used to describe molecular shape.

A metric space which is a flow of a greater containing spectral structure, contains the basic spectra which exists within the same space-

form structure as the metric space's defining flow. Note: A flow can have the properties of being a (sub) space-form. The basic spectra (contained by the metric space's spectral structure, ie its space-form) determines the material eg atoms, nuclei, electron clouds, that the metric space contains.

A metric space flow filters out higher dimensional structures. Interaction space-forms intersect the metric space's flow. The metric space flow exists on some ultimate (dimensional) space-form which contains it (the metric space flow). The interaction space-forms which intersect the metric space cannot move outside (or away from) this metric space that they intersect, though they can move a limited amount within the intersection set, ie interaction space-forms intersected with the metric space. They can move with a system in the metric space, such motions require interactions and such interactions include both (dynamical) interaction and light interaction, space-forms. The velocity of such a system is, V_s so that V_s, $\leq C_o$. If a physical system's interaction space-forms are contained in a higher dimensional metric space [so that, V_s, defines the interaction space-form's velocity in the higher dimensional metric space] and if the physical systems contains light, say trapped by reflections, then that contained light's velocity can be increased or decreased by, V_s, if the 3-dimensional interaction space-form does not reform (that is, disappear and reappear) with each spin rotation's change in time state. In order to get this change in speed for light, C_o, let us also assume that we want to go faster than C_o, then the interaction light space-forth needs to interact at the level of the light's space-form whose containing metric space's dimension, is one more than the dimension of the material containing metric space. To go faster than the speed of light in a metric space, which is a flow of a space-form, one needs to control material geometry in the metric space one dimension higher than the dimension of the metric space which contains the material from which the light was emitted. This happens naturally when the 3-dimensional interaction space-form is the space-form which is holding say an atom's nucleus and electron cloud together. However, if there are 3-dimensional material charges in the, higher dimensional metric space associated to the neutral spatial face, of the 3-dimensional interaction space-form, they tend to have a total neutral charge, hence, they do not cause changes in c". Although it sometimes happens naturally in this and other interaction

contexts, but it is rare since a subspace which is one dimension less that its containing metric space has measure zero. The metric space having measure zero means that encountering this lower dimensional metric space is rare in the higher dimensional metric space.

Light is a 3-dimensional interaction space-form but it is usually "not moving in 4-dimensional space" because when it forms it breaks from the original 3-dimensional interaction space-form that binds the atom together. When this break occurs then the motion of the system which light is forming from is the motion of a 2-dimensional neutral face of the original 3-dimensional interaction space-form. The motion of this 2- dimensional space-form is with respect to an "absolute" 3-space which the 2-dimensional neutral face identifies by its infinite reach, so that the motion of the 2-dimensional space-form causes frequency shifts but not velocity changes for the 3-dimensional light space-form.

Originally the atom is a 3-dimensional combination of the nucleus, the electron cloud, and the neutral 2- dimensional interaction face which together form a space-form. However, the energy level that a charge occupies changes when light forms, and light has the structure of a new 3-diemsnional space-form composed of the new state that charge has come to (now) occupy, the neutral 2-dimensional infinite extent interaction face that carries energy, and the (currently) occupied charge state, which can change to a new occupation state when die energy carried by the light is absorbed by that atomic structure. It is this 3- dimensional charged space-form which can move with respect to a 4-dimensional metric space, so that if this 4-dimensional motion occurs then light's velocity must change in both its 4-dimensional metric space and in its 3-dimensional metric space that the light's 3-dimensional interaction space-form intersects.

If light were trapped in a thermal system, say, within a thermal system whose energy range is similar in value to the energy of occupation states of electrons, so that electrons are constantly changing their occupation states, so that this is caused by (and causing) light interactions, then the 3-dimensional light space-forms will be related to negative charged space-forms (though the 3-dimensional negative charges will for the most part be outside the 3-dimensional metric space) so the 3-dimensional light space-form's motion can change. The change must originate from a state of rest (in the 3-dimensional metric space, because

light's infinite reach makes the 3-dimensional metric space that it intersects an absolute space which is its own rest frame) and the statistical effect should be similar to a random walk, hence, statistically the speed of light stays constant. The types of interactions that occur in a heat reservoir, so that if one only one dimension is considered, are the three interactions where (1) the charges are moving in the same direction as each other, or (2) the interactions where the two charges are approaching one another, ie moving in opposite directions from each other. (3) the charges are moving away from one another. When the charges approach one another, as in interaction (2), then they will get closer together so the interaction is stronger, while when they are moving in the same direction as in interaction (1) or moving away from one another as in (3) the interaction will be farther apart. Hence, statistically the biggest effect will be from (2) and its cause will be to slow the speed of the moving charges (associated to the light space-forms) down. Thus, statistically the effect would be seen as a gradual slowing of light, due to the deceleration of light's associated charged 3-dimensional space-forms. It seems that this can be enhanced by cooling.

Light emerges from an infinite extent, 3-dimensional interaction space-form, and forms an infinite extent, 2-dimensional space-form that is the neutral face of an infinite extent, 3-dimensional interaction space-form. This infinite extent, 2-dimensional neutral face carries the internal energy of one stable system of material to another stable system of material. It comes from the neutral side of interacting charged systems, and its property of mass is dominated by the neutrino part or infinite extent property of a space-form. Neutrinos are always paired with neutrons on the neutral, spatial interacting faces of interaction space-forms. The neutron gives the infinite extent light space-form its energetic (or vibration) signature.

That is, the neutrino's infinite extent is related (on a Euclidean space-form) by an irrational number that is close (or smaller) in value to the fractional value of the neutron's orbital length. Furthermore, the dual

neutron-neutrino structure allows light to be related in energy to either electron energy levels or proton energy levels, ie nuclear levels. The finite toral form in the hyperbolic space-form that is related to the neutron in the

neutral structure of light has its orbital energy related to the difference of the initial and final states of the charge which changed its internal states in the material system from which the light emerged. it appears that a 2-dimensional infinite extent space-form of light manifests with an internal energy transition, so that the energy identifying toral (neutron-like) shape forms a vibrational spherical shell which moves along the infinite extent (light) space-form's arms, so that the space-form is centered (or symmetric) about what was the energetic source of the light wave. It is actually the neutron part of the 2-dimensional space- form that moves along the infinite extent arms at the speed of light. Being both neutral and an interaction space-form face, means that it can pair with charges having orbital energies related to the light space-form's vibratory signal. The "vibratory propagating signal' is best modeled in terms of oscillations back and forth between infinite extent and finite extent (neutral) space-forms of the neutron-neutrino pair, so that the finite extent toral shape of the space-form changes its position along the infinite extent space-form, doing this at the speed of light. Because it is also a neutral, infinite extent space-form, it can only have physical manifestations (changes in energy levels) if it is a part of a 3-dimensional interaction space-form. [Actually the finite toral shape (associated to the neutron) itself can also become infinite extent, but it retains the energy value of the finite neutron.]

The infinite extent, 2-dimensional face (or space-form) can be moved by a 4-dimensional interaction space-form which has the original 3-dimensional interaction space-form (from which the light emerges) as one of its faces. This would mean that the original 3-dimensional interaction space-form is moving when the light emerges. This motion would be additive to the velocity of light because it is motion which is outside the 3-dimensional metric space's bounds. Unfortunately this original 3-dimensional space-from is broken when light forms so that the infinite extent 2-dimensional light space-form defines an absolute relation to the 3-dimensional metric space within which it is contained.

The vibrating 2-dimensional space-form (face) of light can identify a 3-dimensional interaction space-form with other charges so that the (new) 2-dimensional charged faces of the 3-dimensional interaction space-form are outside the 3-dimensional metric space. Then this 3-dimensional charged space-form can become a charged "face" of a 4-dimensional

interaction space-form. This can cause the 3-dimensional light space- form to move. Hence, in this case the speed of light, c, is increased and/or decreased because the space- from of light is moved in a 4-dimensional metric space, a metric space that is outside the 3-dimensional metric space that light's infinite extent space-form is defined on. For these 4-dimensional interaction space- forms to exist, there must be 3-dimensional charges in the 4-dimensional metric space so that they art- in the correct or necessary position in space in order to cause the 3-dimensional interaction space-form of light to move, and this motion must be projected down into the 3-dimensional metric-space that it intersects.

Problems with Even Dimensional Metric Spaces

However, a 4-dimensional metric space does not have well defined dynamics. Instead system's dynamics must be related to processes which actively, ie mentally, make connections between material (systems). The 4-dimensional interaction space-form connects 3-dimensional material space-forms within a 4-dimensional metric space.

Only the 3-diniensional space-form could be energy generating in such a 4-dimensional interaction space-form. However, we want the 3-dimensional space-forms to be actively connected. This would require a 5-dimensional space-form, which has the spectrum of the desired 3-dimensional space-forms within itself. This would allow the desired 3-dimensional space-forms to be connected as wanted. They would be connected by the 5-dimensional interaction space-form. The actual, connection is being made by the 4-faces of the 5-dimensional space-form. Thus one, (if not all) of the 4-faces must have the desired 3-dimensional space-forms spectral properties, along with a spatial 3-dimensional space-form connecting them, as part of its face structure. The 3-dimensional space-form that identifies light in the 3-dimensional metric space, then dictates the position of interaction, while the 5-dimensional space-form actively creates the connection of the desired 3-dimensional material space-forms, thus causing motion of the light space-form in the 3-dimensional metric space, to be additive with respect to the 4-dimensional metric space, and hence its signal's would be faster than the speed of light.

How can a 5-dimensional energy generating space-form be constructed so that it has the desired 3-face spectrum? The 3-dimensional space-forms in general are connected through resonance and/or through neutral spatial faces of 3-dimensional interaction space-forms. Thus the original 3-dimensional interaction space-form, that light emerges from that intersects the original containing 3-dimensional metric space, identifies the space-form that the 4-faces of the 5-dimensional space-form need to be in resonance with. This 3-dimensional interaction space-form's various relations to charge, would in turn identify the other space-forms that the systems needs to be in resonance with, in order to achieve the motion of light's 3- dimensional space-form. Thus, to know what space-forms are wanted, and then to connect these desired space-forms together is what the 5-dimensional space-form does through a resonance relation between a particular spectral element in both the fiber group, and with a spectral space-form in the containing metric space. If the system has a global view of the space-form containing metric space (a higher dimensional metric space allows such a global view) then creating the connection [so it is contained within an energy generating space-form, which must be of a higher dimension than the space-forms for which a connection is desired] is quite possible. That is, the connecting space-form only resonates with a very limited spectral set, so that the space-forms separated by a great distance in a metric space can be easily connected, because the connecting space-from only connects with what it resonates with, ie what it "sees," and that spectral set is very limited.

It is easier to describe how to construct an energy generating machine than it is to describe how to control 3-dimensional charges in a 4-dimensional metric space in order to cause the speed of light to change in the 3-dimensional metric space, within which it is contained.

New energy sources from alternative uses of mathematical patterns to describe the physical world

There is a belief that, the laws of physics are known and that the patterns of the physical world must be described in terms of these laws. The fundamental pattern of these physical laws is that material exists in either 3-space or space-time (with background spherical symmetry) so that

solutions to differential equations of particular types [primarily, minimum energy variation problems, the resulting differential equations are, in fact, equivalent to Dirichlet (or Neumann) Laplacians] will describe either material geometry or the probability that particulate events occur at positions in space (or space-time).

If one is interested in invention then one should pursue alternative causal descriptions, because invention most easily follows from causal descriptions. On the other hand probability describes traits but (usually) without a means to effect control over these traits, unless one has available reservoirs of event generating populations.

Consider an alternative description of material and space and ask, "What type of a spatial and material system could be used for energy generation in a 3-dimensional metric space?" It would either be related to the mixing of material from two different metric states, or it could be related to controlling the energy of an oscillating energy generating space-form. Because oscillating space-forms get their energy from the mixing material of the two opposite metric states, the two techniques are related.

What are the conditions that a system must satisfy in order to control an energy generating system by means of a physical description? First the systems being controlled must be of dimension three, four and five. This is because it is only in these metric spaces that material has the property of having a well defined position. One must understand the structure of both material interaction and the metric space, itself, in great detail so that solutions to the metric invariant differential equations in both space-time and Euclidean spaces can be sought in dimensions 3, 4, 5 and possibly 6.

The metric invariant equations are equivalent to using the Dirac equation whose Hermitian boundary conditions are obtained from the space-form structure of both material, interactions, and metric spaces. To understand the geometry and the dimensional hierarchical properties which govern cause and effect so that the higher dimensional world of material geometry can be seen," one must use analogy. That is, the geometry of these higher dimensional metric spaces is determined by self similarity and analogy. The material (events) in the 4-dimensional metric space that are related to material events in the 3-dimensional metric space, are formed by material sets composed of both interaction and oscillating 3-dimensional space-forms (or systems). Unfortunately our 3-dimensional world has

measure zero within the higher dimensional metric spaces, this means that the size of the material set in the 4-dimensional metric space, that is related to the 3-dimensional metric space, might be quite small.

The basic idea of an energy generating device is that, the spectrum of an oscillating space-form needs to resonate with (as well as sustain) a dissipative material system in a 3-dimensional metric space, so that this material system is defined by the same spectrum as the higher dimensional oscillating (energy generating space-form.

The underlying principles for tapping into an energy generating space-form is that the material of a particular dimension metric space always has the structure of two charged manifolds, and the binding energy for the entire system comes from the energy generation of the oscillating space-form whose energy is channeled to the material through resonance relations. This means that the material needs to be resonant with the oscillating (energy generating) space-form.

Further details of the energy generating system include an electrical circuit (in 3-dimensions a metal crystal is modeled as a pair of 2-dimensional charged space-forms held together by a 3-dhnensional interaction space-form) so that the resonant frequency of the of the circuit coincides with one of the principle frequencies of the energy generating, oscillating space-form. Such a circuit could be modeled as a series RLC circuit (resistance, R, inductance, L, and capacitance, C) (see elementary physics text).

The energy generating oscillating space-form could be either 5-dimensional so it would be contained in a 6-dimensional metric space or 3-di-inensional in which case it would be contained in a 4-dimensional space.

If 5-dimensional then its 4-faceg would define metric spaces which contain the 3-dimensional space- forms which are either interaction space-forms and hence neutral, or material space-forms in which case they are composed of 3-dimensional space-forms of positive or negative charge. If in a 5-dimensional space-form then these 3-dimensional space-forms need to be in resonance with the 3-faces of the 4-faces of the 5-dimensional oscillating space-form. These 3-dimensional space-forms (faces) need to also be in resonance with the circuit. The circuit is a combination of crystals including metallic crystals. Metallic crystals have energy levels close together so (it is said that) an electron gas forms within the crystal.

This can also be viewed in terms of a very ridged energy level structure, like rings about Saturn but rings composed of ridged bodies, of charged currents in the crystal which can be pushed on by energy generating charged 3-dimensional space-forms. These 3-dimensional charged space-forms model the components of the circuit like a battery or energy supply. The passive circuit elements like the capacitors and inductors and resistors can be modeled as 2-dimensional, charged space-forms. The resistor will have many energy states into which the energy of the circuit can be absorbed. Crystals have the structure of two 2-dimensional charged space-forms being held together by a neutral 3-dimensional interaction space-form.

The resonant frequency of the circuit needs to be modeled by the crystal (space-form) circuit and the positive and negative 3-dimensional charges (held together by 4-dimensional interaction space-forms) which model the circuit's (active) energy generating component, so that the 2-dimensional crystal connected to this energy source has a resonant frequency with either one of the 5-dimensional oscillating space-form's primary frequencies, or with one of the 3-dimensional charged space-form's primary frequencies. That is, the 2-dimensional space-form has current lengths which are resonant with either the oscillating 5-dimensional space-form's 2-dimensional current lengths or the oscillating 3-dimensional space-form's 2- dimensional current lengths. Either the oscillating 5-dimensional space-form or the oscillating 3- dimensional space-form needs to be in resonance with (1) the circuit, (2) the material system, and (3) a system which dissipates the energy of the current.

The circuit's energy source is modeled as a pair of opposite charged 3-dimensional material space-forms. The negative space-form models the pathways of the circuit, while the positive space-form models a nucleus type structure positioned at the positive pole of the component (both charges are usually outside the 3-dimensional metric space which contains the system). Holding these two 3-dimensional charges together (by means of a 4-dimensional, neutral, interaction space-form) results (if connected properly) in the circuit being powered so as to have current flowing in it. Each passive component has a similar 2-dimensional charged space-form structure associated to itself. While the dissipative component has a more

elaborate 2-dimensional charged space-from structure, which allows more energy absorption by the dissipative sub- system's energy states.

The 3-dimensional charged material is oscillating, hence generating its own energy. This could be a model of a radioactive material. Radioactive material has its own oscillating frequency (or time period), namely, its half life. This half life has a related frequency, and if the circuit's natural frequency is in resonance then resonant energy can couple between the energy source and the (tuned) circuit. The radioactive material has a crystalline charge structure, i.e. nucleus and electron cloud or Fermi surface, that is separable in space. Thus, by attaching the circuit at the correct positions in the crystal, namely, at the “nuclear center” of the crystal and at the Fermi surface, the energy of this charge separation and its oscillation can be coupled to the circuit.

Three dimensional charged oscillating space-forms are used to model an oscillation source of energy. This could be used to model radioactive material. Such a model of radioactivity needs to be a 3-dimensional charged, oscillating space-form, because the neutral interaction 2-dimensional faces cannot themselves oscillate. It is only within a 3-dimensional material space-form that oscillation can occur. Hence there is a 3- dimensional space-form whose charged structure lies outside the boundaries of a 3-dimensional metric space. It is outside the 3-dimensional space simply because a 3-dimensional space-form determines a geometric form in a 4-dimensional space. These 3-dimensional space-forms exist in a 4-dimensional metric space, yet they move confined to the, 3-dimensional metric space that they intersect.

These 3-dimensional space-forms need to be described in their 4-dimensional containing space, and then projected into the 3-dimensional metric space where the material that they are going to interact with, ie the circuit, is 2-dimensional. The 3-dimensional oscillating space-form need to have added to themselves the current lengths that are resonant with the RLC series (resistance, R, inductance, L, and capacitance, C) circuit's natural frequency (see elementary physics text). This could be accommodated by a choice of circuit components including the nature of how the resistor absorbs energy. The description of this system depends on frequencies of flows, states of flows, and curvature of space-forms, along with the projection (or intersection) of this 4-dimensional system into (or

with) 3-space. Much of this description can be given in terms of solutions to Dirac operator differential equations whose boundary conditions are determined by space-forms of material and metric spaces which can be projected into Hermitian space, within which both material dynamics and light interactions occur. Then these Hermitian space events are projected back into the real and pure imaginary subsets of the Hermitian space. This results in an accurate (truthful) description of material behavior in space.

An alternative to tapping into the energy of oscillating space-forms is to be able to mix material from opposite metric states, ie matter and anti-matter. Such opposite states flows are rigidly separated by spin rotations on space-forms. This means that the properties of opposite state flows on space-forms needs to be taken into account in the energy generating oscillating space-from model. Namely, the oscillation causes material in opposite metric states to come in (or to be forced into) contact and it is this contact that generates the energy (due to the annihilation of matter and anti-matter) of the oscillation.

The property of radioactivity assures that there exist both positive and negative 3-dimensional "charges" that surround the 3-dimensional nuclear-interaction-electron-cloud space-form of a radioactive element or material.

How does one relate a half life of a radioactive material to a frequency? When the oscillating space-form oscillates, energy is generated when matter and anti-matter are forced into contact with one another, this happens when the opposite metric states of the space-form are vibrating into one another. These contacts are random, hence, their description would based in probability, so the uncertainty principle applies in this situation. Thus one can use the uncertainty principle and the energy liberated by the radioactive material in its half life multiplied by the fraction of this energy that is liberated in one spin cycle.

The oscillation of the radioactive material's space-form is related to the spin state rotations of a space- form. The idea being used to find the period of one spin rotation, is that in one complete period of a spin rotation of states on a space-form, light should only be able to travel the distance of an atom's radius. This is because changes in energy states result in light forming, and this must occur as jumps within the atom and they must occur as the spin states are rotated from one state to another state, so light cannot

travel beyond the atom in this spin period of time. So (the radius of an atom)/(the speed of light)=(the period of a spin rotation).

To make this energy generator, one takes a mole of radioactive material in crystalline form. It is coupled to an RLC (resistance, R, inductance, L, and capacitance, C) circuit with wires that are positioned (1) at the position of the Fermi surf4ce for the electron cloud of the crystal, and (2) at the position of the 3- dimensional, charged space-form's nuclear center, that is both small and within the Fermi surface. [Actually the 3-dimensional charge itself is mostly outside the 3-dimensional metric space, but its polarizing affects should be present.]

What properties of the crystal can be used to help create a resonate structure between the radioactive crystal and the circuit's natural resonance? What properties of resonance chambers can also be used? The higher 5-dimensioiial oscillating space-form which contains the oscillating 3-dimensional space-from would be the perfect "resonance chamber" to use in this system.

When the oscillating space-form oscillates, energy is generated when matter and anti-matter are forced into contact with one another, this happens when the opposite metric states of the space-form are vibrating into one another. These contacts are random, hence, their description would based in probability, so the uncertainty principle applies in this situation. This means that ΔE x $\Delta t = h$, can be used to determine the radioactive material's natural (or resonant) frequency. This means that, AE, the fraction of the half life energy liberated by the radioactive material in one spin cycle, is needed to determine the radioactive material's natural frequency.

$$f = \frac{1}{\Delta t} = \frac{\Delta E}{h}$$

Now ΔE, is the energy released due to radioactivity in one time period of a spin rotation. It is determined from the amount of radioactive material which decays during the material's half life.

$$\Delta E = \frac{T_{sr} E_d A_v A_0}{T_{\frac{1}{2}} A_{mole-weight} 2}$$

Thus the quantity of radioactive material is directly related to the radioactive material's natural frequency.

The energy given off in one nuclear decay, can be multiplied by Avogadro's number, [and this is multiplied by (half, due to half life) of the original quantity of material, (which decays in the time period of one half life), [and which is also half the same amount of radioactive material to be used to couple to the circuit] and this is divided by the mole weight, in grams, of the radioactive material. This gives the energy liberated by the disintegration of the radioactive material in one half life. Finally, this number is multiplied by the ratio of (the period of a spin rotation)/(the half life [time]), to give the fraction of the total energy (which was released in the time period of the radioactive material's half life) that would be released in the time period of one spin rotation.

If the half life is about a billion years or, 10^{16} seconds, and the energy released is that of a neutron which is about 10^{-10} joules, the period of the spin rotation is of the order of 10^{-20} seconds, and estimate,

$\frac{A_0}{A_{mole-weight}}$, the number of moles as 1, and Avogadro's number is

about, 10^{23}, and with Planck's, constant at about, 10^{-34}, then this results in a natural frequency of about, 10^7 hertz.

This means that, if the inductance of the circuit is about 10^{-6} henrys, and with the above frequency of, 10^7 hertz, then the capacitance in the RLC circuit should be about, 10^{-11} farads, in order for the RLC circuit to be in resonance with the radioactive material's oscillating space-form. In this case the RLC series circuit would be in resonance with the natural frequency of the radioactive material's oscillating space-form.

For such a capacitor, if its plates were separated by 0.01 meters, then the plates should be about, 0.01 square meters, in area, so as to get the

circuit's natural frequency to be the same, 10^7 hertz, as the radioactivity's natural frequency.

Key words that can be used to express the main idea

Coordinates - Used to identify positions of things in space

Metric - Formula which is used to determine the lengths between points in a coordinate space. Typically this is the formula found by Pythagoras. The Pythagorean formula can be modified by changing the sign (positive or negative) of the terms in the formula for length, in a coordinate space.

The signature of the metric - The number of positive and negative terms in the metric

Metric space - Coordinate space which has a formula for length associate to itself

Isometry groups - Sets of matrix transformations of (local) coordinates. Such sets of matrix transformations which leave a length (determined by a metric) invariant after the transformation has taken place, are called isometry groups. An example of an isometry group is the rotation group.

Discrete groups - These are subgroups of the isometry groups which have a geometric relation to the coordinate space. Namely, they partition the space as an infinite checker board would partition the two dimensional plane

Fundamental domain - The individual partitions of a discrete group, it would be a single square of the checker board partition of the 2-plane.

Faces - The edges (or higher dimensional faces) of the fundamental domain of a discrete group, eg a cube is a fundamental domain for Euclidean 3-space, its six faces are each 2-dimensional.

Space-forms - By identifying pairs of "opposite" faces of the fundamental domain, a new smooth geometric shape can be formed. The identified faces on the fundamental domain become identifiable Flows, and on hyperbolic space they are the natural vibrating lengths (and areas etc) on the space-form.

Maximal torus - Within any isometry group is a set of diagonal matrices which compose a subgroup of the isometry group, called (if the group is bounded) the maximal torus.

Fiber - Above each point in a coordinate space, various mathematical structures can be defined. Such structures are called fiber structures. A vector field is such a structure, and isometry groups can also be identified as fiber structures.

Function spaces - Large sets of functions that are characterized by some property, eg the set of periodic functions.

Spectral sets - Within a function space there exist a set of functions (not as big a set as the function space) which has the property that any function in the function space can be represented as a long sum whose terms have elements from the spectral set as factors. For example, the set {sin(nx)} is a spectral set for the periodic functions.

Spectra - The natural lengths of vibration of a physical system. Sets of space-forms can also identify spectral sets.

Large spectral sets on a maximal torus - large spectral sets can be identified with and defined on the maximal torus.

Resonance - A property that two systems (that have the same natural vibrations) have, such that one of these systems will start vibrating when the other system is already vibrating.

Hyperbolic space - A metric space that has a particular signature metric. Hyperbolic space's space-forms have particularly stable spectral properties. Namely, the geometric measures of the faces of the fundamental domain determine the hyperbolic space-form's natural vibrating properties

Euclidean space - A metric space with a particular signature metric, namely, the usual formula of Pythagoras.

Eigenvalues - The natural vibrations of a physical system, eg the natural lengths of vibration of a physical system. Eigen values are associated to eigenfunctions, which are the sets of spectral functions of a function space.

Self similar - A pattern (or shape) which repeats itself, either at different scales (sizes), or at different dimensions of a multi-dimensional system.

Metric states - Spectral flows are formed in pairs on space-forms so that each flow is given the opposite state of the physical property that the particular metric space is associated with. Each distinct flow of a pair of flows is given the property of a particular state, this state is called a metric state.

Godel's consistency and completeness theorems - A mathematical theory which says that there are always mathematical patterns that exist outside any fixed language or system of axioms

Platonic forms - Mental forms or patterns that come into existence by thought or by definition. There is no guarantee that these Platonic forms are of any value as patterns which can be used to describe the external world.

Laplace-Me differential operator - A metric invariant differential operator.

Dirac operator - The square root of a Laplace-like operator, which results in the proper matrix structure needed to deal with the spin properties of spectral flows on space-forms, is automatically incorporated into the Dirac differential operator.

Differential forms - Are local (or differential) geometric structures related to the geometric structures of length, area, etc., that naturally exist for geometric objects, which in turn, exist in any particular dimensional coordinate space.

Main Idea

A self similar structure of space-forms on a dimensional hierarchy of metric spaces creates the physical world and structures beyond the physical world. These space-forms govern material, spatial, interactional, along with living, and mental systems that exist in the world, but which depend on properties beyond the 3- dimensional world of our experience. The Dirac operator is used to define differential equations for physical systems that are determined by material space-forms. The Dirac operator is needed because the metric states of spectral flows on the space-forms must always be taken into account. The use of the Dirac operator has an underlying assumption that the coordinate space is actually a Hermitian space, ie a complex metric space. This complex structure is needed to take into account the pairs of metric states that are found, as flows on space-forms. The Dirac operator acts on differential forms that are defined on space-forms.

In order to bring about "universal" resonance for a large (high dimension) spectral (or space-form) system, and to allow memory and multi-various spectral connections, a large spectral set exists on a maximal torus of the fiber isometry groups, defined over the coordinate space. The spectral sets on a maximal torus allow oscillating space-forms to determine a domain of influence through resonance, so that other spectral influences are filtered out of a given spectral structure's properties, which include having a particular material geometry in space.

Conclusion

One can easily see that using language in new ways opens up the realm of possible descriptions so that solutions to the difficult questions of physical description might yet be solved. One is more likely to describe hard to describe physical systems by trying to use language in new ways, than by trying to force solutions through horrendously complicated calculations, calculations that are within a mathematical structure that is based on a language which will not allow the actual pattern of the physical world to be described. As it now is, the simplest physical systems are indescribable in terms of the fixed language which is used. That language is used more as a standard for a contest than as a true attempt at describing the world in a truthful manner.

For illustrations, contact the author.

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You Can't go Faster than Light: However...

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Abstract: The light barrier is examined closely in an attempt to find a way through it. It is believed a way is found; and relativity, far from suffering as a result of this close examination, is stronger than ever because we are now able to understand it better.

Glossary: photon - a metaphorical atom of light or radiowave
RR - Rocket Rider

INTRODUCTION -

It's true. Under the second postulate of special relativity we can't outrun photons. We can't catch up with them. Hey, we can't even gain on them. (But then neither can a photon stretch its lead.) But one should not read more into that than is there. It does not say our speed is limited; it is only that light manages to always outmaneuver us; a little like the cloud of dust that perpetually follows that Peanuts character around.

But now we encounter a popular logical paradox, repeated over-and-over down through the years, generally NOT recognized as being a paradox at all. Typical is this from Zimmerman & Zimmerman (1993): "The speed of light in a vacuum is the limit at which anything - matter or energy - can travel." The paradox is this: that speed, the speed of light, is both an upper limit and a lower limit for photons; so if it also acts on rocketships, then how can we suppose it to be an upper limit when it is clearly not a lower limit? Where is the logic there? No, that logic is faulty but it is widely subscribed to nonetheless.

That logic is faulty for another reason as well, for it assumes rocketships are macrophotons, something we know they are not.

A third paradox is that there is no road in space along which to post the presumed "SPEED LIMIT 300 Mm/s" sign for RR. To put it bluntly, many have put faith ahead of logic and rationality in this field. Julius Caesar said it: "Men willingly believe what they wish." And men blindly parrot the statement, "You can't go faster than light," without knowing what it means precisely. They say it with no sinister intent, but that repeated saying has the effect of brainwashing, and holding back, each new generation. And when you ask them how they know that, they say Einstein said it; but when you show them that in 1921 he changed his mind, they fall silent. With a fuller reading of Einstein, Zimmerman & Zimmerman's statement is seen to be false and all three of those paradoxes go away. Relativity emerges fully intact.

A ROCKET IS NOT A MACROPHOTON -

Light does not conspire with space and time like three traffic cops to restrain us; rather, we are free to move as we wish provided we can find the traction; the thing that gives rise to the confusion is just that light adapts to our state of motion to always go faster by 300 Mm/s.

The speed of light in free space as measured by every observer is *c*, numerically 300 Mm/s (exactly 299.792 458 million meters per second); that's the universal constant called "the speed of light".

And in a race against a lightbeam we'll always lose. The reason? Space "resonates" like a banjo string to always keep the determined (sensed) speed of propagation of incoming light and radio waves at c no matter who is making the determination or doing the sensing. It's as if the photon is saying to RR,

Out here in space it's just you and me kid, and you'll never get away.

Light doesn't hold you back; in a sense you pull light along with you. Once launched from Earth (or wherever) photons have no memory of their launch point as regards speed. They do not reference their speed to the launch point, they reference it to where you are; that is, to the eye of the beholder. This was most unexpected. The second postulate of special relativity says it all:

"Any ray of light moves in the 'stationary' system of coordinates
with the determined velocity *c*, whether the ray be
emitted by a stationary or by a moving body."
... A. Einstein as translated by W. G. V. Rosser

Interpretation: “An incoming light ray hits you in the butt at a speed of 300 Mm/s -- not 299, not 301 -- no matter what.”

It took a long time to see that there is no need for a medium for light - a "luminiferous ether". The second postulate has replaced that need.

The speed of photons is invariant and independent of their launch point. Finally in contrast to the situation with photons, it is necessary to reference both a rocket's speed and its energy to its launch point. A rocket is not a macrophoton.

For the past century there has been a big misunderstanding; namely the idea that we must be able to literally outrun photons in order to fly away from Earth faster than 300 Mm/s.

When a radio signal is launched into space from an antenna, it is handed off from electric to magnetic field and back again, over and over, repeatedly, as it spreads outward. The action is such as to make the launched energy lose touch with the source, and the radio energy which exists for RR moves past him with speed *c* because the space around him resonates at that speed. To repeat; when oscillatory electromagnetic energy (lightwave or radiowave) reaches our position, it propagates past us, causing the space there to resonate. That is to say, the energy passes by us or impinges at the resonant speed of space which is 300 Mm/s, a number we call "c".

This is all in accordance with the second postulate, and it is as it must be since a physical medium is not involved in the propagation of light through free, empty, space. There is no rational way around it. Nature always takes the rational way even though we often have trouble seeing it. In interstellar space, there is some matter and there are some fields, and so there are those additional factors to contend with; but they are minor - even less in intergalactic space. And to reach intergalactic space, you only need to go above or below the galactic disk.

A DIFFERENT QUESTION -

The flux of electromagnetic energy in a laser beacon from Earth strikes our rocketship at a speed of 300 Mm/s regardless of how hard we drive our ship away from (or towards) Earth. Every inertial (unaccelerated) observer is at rest relative to space, so to speak. (Recall that there is no absolute inertial frame.) So is that the end of it? Once we find ourselves inside a field of photon flux, are we somehow mysteriously doomed to remain there forever? Is it like Achilles who, it was said, could never hope to get out in front of the tortoise once he found himself behind it? Turns out that the secret to Achilles winning the race was for him to focus on a place beyond the finish line -- not on the tortoise. If you set your sights on a lesser goal it is fairly certain you will not reach the larger goal. Winning (or losing) truly begins with a state of mind.

So does all this mean we can't outrun the leading wavefront of a radio signal sent into space, say in the year 1898 by Marconi? The harder we try to get out in front of it, the more we will fail for we cannot outrun the photon flux from which it is made? Is that all that awaits us? Einstein's boyhood dream is said to have been to know what it would be like to ride on a beam of light. Well, nobody will be throwing a saddle on a photon in this universe. However...

There are stars out there beyond 107 lt·yr (light years) where that radio signal has not yet reached. There is a place - there are lots of places - where Marconi's signal has not yet reached. Is our rocketship unable to reach any of those places before the 1898 radio signal does? Isn't this a different question from whether or not we can outrun light? Of course it is. What can stop us.

Only 83 years remains before Marconi's signal will reach Beta Centauri, so we'd better get started if we want to get there first.

THE PHOTON WIND -

(Sing to the tune of "The Summer Wind")

The photon wind -
The photon wind
Keeps blowin'me back.

Or so I'm told
Out in the cold
I can't get back.

But then I try
And my oh my
To my surprise, it seems,

Startling as all my dreams -
The photon wind.

There may seem to be no way out of that field of photon flux or "wind" but there is a way; I don't mean sideways, I mean straight ahead. Stay with me now. We all decide to stay home this trip; except eight of us: Captain David Gallegher with his crew of three and four ambassadors/ancillae. David and the others embark on a trip, making a beeline towards Alpha Centauri. They'll go out four years and return in another four, continually accelerating or decelerating so as to maintain a full Earth gravity (1G) on board except when they pause at the turnaround point to place two spacebuoys. Then we'll all compare notes after they land back on Earth.

My money is on them reaching Alpha Centauri - you may say they will not. I say that the spacebuoys will actually be satellites of Alpha Centauri G4 - you may say they will not. I say they will reach a speed relative to Earth of twice lightspeed - you may say they will not. I say they will be substantially the same age as we when they return - you may say they will not. It's a free country. It is a Grand Experiment to find out.

Relativity is taken as a given. Whichever the outcome, relativity will not have been disproved. Relativity comports with my predicted outcome at least as well as with yours. I've tried hard to explain why. Please meet me halfway before you think to scoff.

Their rocket (actually a ramjet) is designed to collect fuel en route so it will never run out. As we look in, Rocket Rider is moving sublight away from Earth on the first part of the outbound leg, accelerating straight ahead at a constant 1G. In a photon wind emitted from a powerful Earth-based violet-colored laser beacon directed at him, he finds himself in an enveloping cloud of photons from it, part of it impinging and part of it blowing by; a cosmic wind blowing at the constant speed of light as measured on his tiny photon anemometer. When he attains a speed of ½c (150 million meters per second) away from Earth he still sees the photon wind from the Earth-based beacon passing by him at a full 1c, but now it appears red, and that represents reduced photon energy. He has not gained on the photon wind one iota, but it is getting "winded" trying to keep up! Its speed is always constant at a full 1c relative to him.

That strange behavior is so well established that a postulate is recognized to acknowledge it: that's the second postulate of special relativity. We may think of that odd behavior as being a clue to what a photon really is; a photon emitted from Thomas Edison's lamp is like a tone emitted from Eddie Cantor's banjo. Find it hard to make the connection? Everyone does. We've only been trying for a very short time to make that particular connection. ...Since 1938.

The speed of the photon wind will not diminish; it will not change; RR cannot go faster than the light that is streaming past him; but because of Christian Doppler (1803-1853) and Max Planck (1858-1947), he is outrunning its energy. As RR's speed increases towards the speed of light away from Earth, the energy in the photon wind will continue to drop as he continues to accelerate away from Earth, reaching zero as the ship's speed reaches the speed of light relative to Earth where the laser beacon is located. It is true that the photon wind continues to impinge on the ship and pass by at the speed of light regardless of RR's speed; still the Doppler effect $f/fo=(1-\beta)/\sqrt{(1-\beta^2)}$ where β is the ship speed in lights (lt), and Planck's $E=hf$ law which says energy is proportional to Doppler frequency, conspire to diminish the energy in that constant-velocity photon wind as

RR moves faster and faster away from Earth until at the speed of light those photons become irrelevant.[1]

Dude: Well, Clyde, isn't this where you're supposed to break in and say something like 'You can't accelerate through the speed of light'?

Clyde: Like you said, Dude.

Dude: So what happens as RR approaches c, the speed of light – at $\beta=1$. Does his engine mysteriously flame out, never to lite again? Does a brick wall appear in his path to block his further acceleration? Does space fill with a gooey mess of molasses to restrain him? Does the hand of God appear like a traffic cop's? Just what happens to keep RR from continuing to accelerate?

Clyde: Well, uh... Well Einstein said you couldn't.

Dude: Yes. Well, remember the first postulate says we can just as well consider RR to be at rest as the Earth, so it would be silly to think that anything of that kind would happen.

RR encounters no brick wall or other barrier to hold him back so he continues to accelerate. Nothing can stop him now. Speed relative to Earth is continuously calculated and displayed on the Beta Meter in the cabin "for the benefit of the tourists"; 0.98, 0.99, 1.00, 1.01, 1.02, 1.03 and so on, right on through the disappearance of the Earth beacon at 1.00 lt on the outbound leg. The Sun has faded to invisibility by then too and it winks totally out. The later readings continue; 1.50, ..., 2.00, ..., for as long as RR continues to accelerate. Of course those are only on-board calculations; but there are certain benchmarks - like the red shift from the Sun for $\beta<1$ and when at $\beta=1$ the Sun winks out. For $\beta>1$ there'll no doubt be Cerenkov radiation from external sources that can be sensed and measured. And there'll be shifting parallaxes from nearby stars to the left and the right which will not have disappeared. It turns out that RR has his sights set beyond c; certainly not simply on outrunning any field of photons; and when he reaches a speed of 1 lt (300 Mm/s) relative to Earth after about a year out, the energy of the photon wind has dropped to zero. [1G acceleration is equivalent to 1.03 lt/yr (lights per year) – see MATH POWER, p.5, Ex.2a, for Nov'03, ISSN 1087-2035.] That particular photon wind has become irrelevant even though its determined speed never

changed. We now see that exceeding the speed of light is nothing special for a rocketship.

The photon flux has faded to a nonentity. RR may still think of photons from Earth and Sun as passing by him at the speed of light but they are only phantoms, lacking energy. From that point as he continues to accelerate, RR is clear of the field of photon flux from Earth. Achilles is now passing the tortoise.

What those back on Earth see of all this is irrelevant. It is nothing more than perception and has no effect on RR. Passive observation by one or a million aliens from afar has no affect on his intrinsic state of being. ...Rationally speaking.

GENESIS OF THE LIGHT BARRIER -

Einstein wrote of the distortions of special relativity as if they were real physical changes to the body resulting from their being observed from afar. “So what...” he said (paraphrasing). “So what if each observer sees a different magnitude of change; each view is real in the eye of the beholder.” Einstein's words may not have been exactly that, but it seems Einstein ignored physicist/philosopher Henry Margenau's admonition that "The tree is real ... because it satisfies the demands of consistency..." (The Nature of Physical Reality, p.292).

As a result of his reality view of the effects of special relativity, Einstein concluded in 1905 that there would be a barrier at the speed of light to further acceleration by any real body. He thought of *c* as being effectively infinite; writing in his 1905 paper (p.903, translated): "lightspeed in our physical theory plays the role of an infinitely great velocity"; as if to say, “The speed of light has long been considered to be effectively infinite although today we know better. But it is my conviction that in the present stage of development of theoretical physics the idea of an effectively infinite speed must still be employed.” Later (1916) he stated it somewhat differently, writing (pp.42-3),[2] "The rigid rod is thus shorter when in motion [and] from this we conclude that ... *c* plays the part of a limiting velocity, which can neither be reached nor exceeded by any real body." And there you have it; the light barrier is born.

Lorentz and Poincaré, who both understood relativity probably as well as Einstein, did not share in his reality view or his conclusion of a

barrier; Lorentz saying (1927), "But I never thought that this [time transformation] had anything to do with real time."

> *1865-1898 was the time of Lewis Carroll's highly popular "Alice in Wonderland" stories; 1895 was the time of H.G. Wells' "The Time Machine". The general public was prepped for more of this sort of thing. Einstein gave it to them in 1905, and Einsteinian relativity enjoyed a decades-long level of popularity that the more mundane Poincaréan relativity probably never could have.*

Everyone deferred to Einstein's judgement. Einstein had taken center stage. But then in an address to the Prussian Academy of Sciences in Berlin on 27 Jan 1921, Einstein gave in; and in 1922 these words appeared in an obscure little book by Einstein (p.35):[3] "*Sub specie aeterni* [After all is said and done] Poincaré, in my opinion, is right." By that time Poincaré, had died. Lorentz was still alive.

Physicists F.K. Richtmyer and E.H. Kennard of Cornell had in 1928 suspected as much; but they were evidently unaware of Einstein's 1922 book confirming their view for they did not pursue it. They were certainly aware of Einstein's 1905 paper which declared in effect that Poincaré, was wrong, and wherein Einstein had first inferred (writing "we conclude") the existence of an absolute light barrier. And so they went with that as 'most everyone else did.

And here's a trap to be avoided: One must not confuse the 1905 Einsteinian light barrier with the second postulate. That change of mind had the effect (generally unrecognized even to this day) of nullifying Einstein's conclusion of an impenetrable light barrier. That barrier could no longer be supported on the basis that the relativistic effects are real; now they admittedly were not real. The constancy of the velocity of light itself is the only unusual real thing remaining about the special theory.

HOW TO BREAK THE LIGHT BARRIER -

Mendel Sachs looked at Einstein's 1921 change of mind and concluded that time dilation of special relativity is unreal, being only an appearance, and that a traveling twin will not age differently because of it than his stay-at-home twin.[4] This, from Sachs (p.977):[5]

> "The crux of my argument was that the essence of Einstein's theory implies that the space-time transformations between relatively moving frames of reference must be interpreted strictly kinematically rather than dynamically. Thus...the transformations are [only] scale changes..."

Sachs had previously announced a similar view in 1971.[6] His colleagues went "AIP" over that! From the amount of negative reaction that there was to his view, it would appear that he was nearly drummed out of the club, the *American Institute of Physics*, Other folks were moved to accusations of stubbornness on the part of nonbelievers when told that the twin paradox is only a paradox. M&M(p.249):[7] "To be sure, some people will refuse to be convinced and will continue to doubt the reality of what should really be called the `Twin Effect'." Yes, M&M declared the twin paradox to be "real," while denegrating all who disagreed with them. Many fine folk badly wanted it to be real - maybe because it held out the exciting promise of time travel. However, from MP-P (p.142):[8]

> "We have come to see that our minds spontaneously follow a sort of quick and easy shortcut, and that this shortcut does not lead us to the same place to which the highway of rationality would bring us."

Nor should we expect there to be only one highway of rationality. Sachs took a highway leading to an unreal twin paradox, however we might take another road leading to the same place but providing a clearer view of the light barrier. When Sachs looked at the 1905 Einsteinian absolute light barrier in the "light" of Einstein's 1921 change of mind, he did not see it as going away. It's true that without long and thorough audience preparation, such a declaration, if seriously presented, might only get an established scientist elected the new mayor of Crank Town.

Then along came this breakthrough e-mail message:

"The reason that nothing can move faster than c is that in sr, c is the maximum speed of propagation of (any type of) force. The reason that a body moves (effect) is that it was caused to do so by a force (originating in another body). If the body would move faster than c the force could not catch up with it to make it move the way it does!"

...Mendel Sachs, 13 Nov '04

And there you have it; the problem has been defined. To break the light barrier we simply have to find a way to obtain traction! For the reason Sachs gives, it should not be surprising to find that particle speed is limited in particle accelerators and ship speed is limited in light-pressure sailing ships, and that all natural phenomena so far observed are so limited. But isn't that also why San Francisco cable cars are limited to the speed, C, of the cable? "C is the maximum speed of propagation of force." Of course it is.

An accelerated particle or a sailing ship is like a cable car...

Clearly not all vehicles are so limited. A reaction motor does not face the constraint Sachs lays out; the force it produces does not "originate in another body"; a rocket effectively has traction to space itself. That is why we need an onboard rocket engine, and why it would be foolish to embark on a voyage to Alpha Centauri in a light-pressure sailing ship. Those cases are rationally discussed in ch.4 & 5 of the book, *Begin the Adventure*.

But a rocket is an unfettered ride.

(Photos of models from the Danbury Mint)

One may of course thumb one's nose at rationality and choose to believe, here and now in 2005, that the young 1905 Einstein was right and the older 1921 Einstein was wrong about the reality of the relativistic effects; and that observations HERE really do magically affect reality THERE, which was clearly Einstein's assumption leading him to his pre-1921 conclusion of an impenetrable barrier at the speed of light. But that interpretation makes relativity look more like a religion than a science.

Note, happily, that Sachs did not give that reason for the barrier in his above e-mail message. Another pertinent quotation from Sachs (p.30):[9] "...light is [not] a 'thing', like a...jet plane..." That's right; a rocketship is not a macrophoton. Further, a photon (Einstein's photon) may be only a way of speaking.

It now seems that the distortions of special relativity are only a sort of kinematical perspective. An e-mail from Maylasia reader Fauzi Saad received 18 Jan 2005 says it well: "My understanding has always been that the effect from speed is more like appearance and that intrinsic properties do not change."

THE TROUBLE WITH PHOTONS –

The photon idea is a convenient one - and a difficult one at the same time.

One reason for the century-long confusion with special relativity may lie in the idea of light as quantized in corpuscles as it flies through space.[10]

> "Planck believed that light, although emitted from its source discontinuously, travels through space as an electromagnetic wave. Einstein's hypothesis suggests that light traveling through space behaves not like a wave at all but like a particle."
>
> ....pp.1182-3 Halliday & Resnick; a textbook

We all know that the particle or "corpuscular" theory of light is an ancient one which 'most everyone, at the end of the 19th century, thought had been put to rest by J.C. Maxwell but which Einstein found helpful if not necessary to resurrect. Finally, very late in life, Einstein said, "Every physicist thinks he knows what a photon is. I spent my life to find out and I still do not know."

As any radio engineer or ham knows, space has an intrinsic impedance of 377 ohms [$\sqrt{(\mu_o/\varepsilon_o)}=377$] analogously to the characteristic impedance of an LC circuit. Also, it has an intrinsic resonance in its characteristic speed of 300 megameters per second [$1/\sqrt{(\mu_o\varepsilon_o)}$] analogously to the resonant angular frequency of an LC circuit. We can also draw an

analogy to a stringed musical instrument, with the speed of light being analogous not to the speed of sound but to the resonant frequency of, say, a banjo string. Once we switch from the particle idea of light to a resonance idea then the picture begins to clear.

ANALOGOUSLY -

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A banjo string is plucked by a fingertip.
The string resonates - it "sounds" - as the energy of the pluck is transferred to it.
The characteristic resonance of the string sets the sound frequency.
Friction and other effects conspire to make the sound go from strong to weak and away.
The sound is now a ghost but its frequency never changed.

A point in space is shocked by a spark.
The space resonates - it "lights" - as the energy of the shock is transferred to it.
The intrinsic resonance of space sets the light speed.
Doppler, Planck, and a super-fast rocketeer conspire to make the light go from violet to red and away.
The light is now a ghost but its speed never changed.

Clyde: Your banjo analogy sucks, Dude. Sound can't travel in empty space. [Critics can be so unkind!]

Dude: Doesn't have to. A string can vibrate in empty space. Energy is carried in the vibration of the string. Anyway it's not my analogy. It's one pioneered in 1938 for use in antenna design by engineer S.A. Schelkunoff.[11],[12]

Just as Ptolemy did not have the theory of universal gravitation to guide him when he presented his theory of the Universe; and just as Thomas Young did not know of the functional existence of rods (1866) nor had FM radio theory yet revealed how to perform frequency discrimination simply (1947) when he presented his trichromatic theory of human color

vision, Einstein did not have the Maxwell-Schelkunoff analog (1938) or know of Cerenkov radiation (1934-37) when he wrote in his epic 1905 work, "We find that the velocity of light in our physical theory plays the roll of an infinite velocity."[13] We now know that that's a lot like saying a plucked banjo string oscillates at a frequency which is effectively infinite, thereby shutting out the possibility of frequencies higher than that.

THE BOLD SHALL EXPLORE THE GALAXIES -

Yes, space is like a tuned circuit or a banjo string, and *c* is its resonant speed. That's why everyone is "at rest" relative to space and why there is no unique inertial frame of reference in free space.

It's all now perfectly clear. There is a light barrier of sorts but it can be penetrated; and (sorry to say) there is no H. G. Wellsian kind of time travel wherein we can interact with the past - which has passed, or with the future - which is still anurture.

We've just left a century of marvelous adventure stories inspired by the glitz of relativity, and are now entering on a time of real promise; a time of bold exploration to be made possible by a more complete understanding of relativity. And relativity, far from suffering as a result of this close examination, is stronger than ever simply because we can now understand it better. It has not changed, only we have.

REFERENCES AND NOTES -

[1] When ship speed is ½ lt, then f/fo= ½/√(1-¼) = 1/√3, and E=hfo/√3; and with fo=1/380 per nanometer (violet), we have f =1/658 per nanometer (red). Energy per photon has dropped by a factor of √3/3=0.577. On the return trip, photons from the Sun will not become irrelevant as ship speed gets larger. At an approach speed of *c* a new player enters; namely, Pavel Cherenkov. He sticks around as long as the approach speed is greater than *c*.

[2] Albert Einstein, "Relativity: The Special and General Theory," Crown Publishers, 1931 translation by Peter Smith

[3] Albert Einstein, "Sidelights on Relativity," Dover reprint, 1983, ISBN 0-486-24511-X

[4] The traveling twin can still age differently than his brother because of a second kind of time dilation, one due to the general theory. But if both twins experience a continual 1G acceleration/gravitation field, there can be no differential aging from that source either.

[5] Mendel Sachs, "On Einstein's Later View of the Twin Paradox," Foundations of Physics, Vol.15, No.9, September 1985, pp.977-980.

[6] Mendel Sachs, "A resolution of the clock paradox," Physics Today 24, 23, 1971, a publication of the American Inst. of Physics;

[7] Eugene Mallove & Gregory Matloff, "The Starflight Handbook: A Pioneer's Guide to Interstellar Travel," John Wiley & Sons, Inc., 1989, ISBN 0-471-61912-4; Our attempts to reach those two writers by U.S. mail for comment were unsuccessful.

[8] Massimo Piattelli-Palmarini, "Inevitable Illusions: How Mistakes of Reason Rule Our Minds," John Wiley & Sons, Inc.,1994, ISBN 0-471-58126-7

[9] Mendel Sachs, "Relativity in Our Time," Taylor & Francis, London, 1993, ISBN 0-7484-0118-0

[10] The need for Einstein's photon hypothesis was the need to explain the photoelectric effect. Explaining that effect by use of the Maxwell-Schelkunoff resonance analog instead may result in something closer to Planck's view. Planck's photons occur when "nuggets" of electricity (electrons) are part of the light-generating and -detecting mechanisms. Throughout the present article, "photon" has been used in the Einsteinian sense; but more as a convenient descriptive literary form than a physical

entity. It is hard to frame these descriptions in terms of "parcels of waves"; much easier in terms of "photons".

[11] S.A. Schelkunoff, "The Impedance Concept and its Application to Problems of Reflection, Refraction, Shielding, and Power Absorption," *The Bell System Technical Journal*, Vol. XVII, No.1, Jan.1938, pp.17-48; See also Homer B. Tilton, "An Electronic Analog of Relativistic Space," pp.3-14 in Electron and Ion Beam Science and Technology, proceedings of the Third International Conference of The Electro-chemical Society, Inc. 30 East 42 Street, New York, NY 10017; Editor Robert A. Bakish, 1968; Library of Congress Catalog Card # 65-14260

[12] Estill I. Green, "The Story of Q," *American Scientist*, 1955, pp.584-594; The "Q" of free space becomes of interest in the light of the Maxwell-Schelkunoff analog. Q is a dimensionless quantity. From E.I.Green (p.566): "Q for a resonant network is uniquely related to the resonant frequency..." So it would be expected that the Q of a medium would be dependent on the speed of light in the medium. Reading further and simplifying, we find that $Q=\sqrt{(L/C)}/R$. It turns out for a perfectly lossless medium with R=0, which we assume for free space, that $Q=\infty$. For any other medium, Q will be the instrinsic impedance of the medium divided by the losses R in the medium. The reader is now well positioned to calculate the Q for media such as glass and water. And since the width of a resonance peak relates to Q, calculation of dispersion should also be well within reach for any medium based on its μ, ε, R.

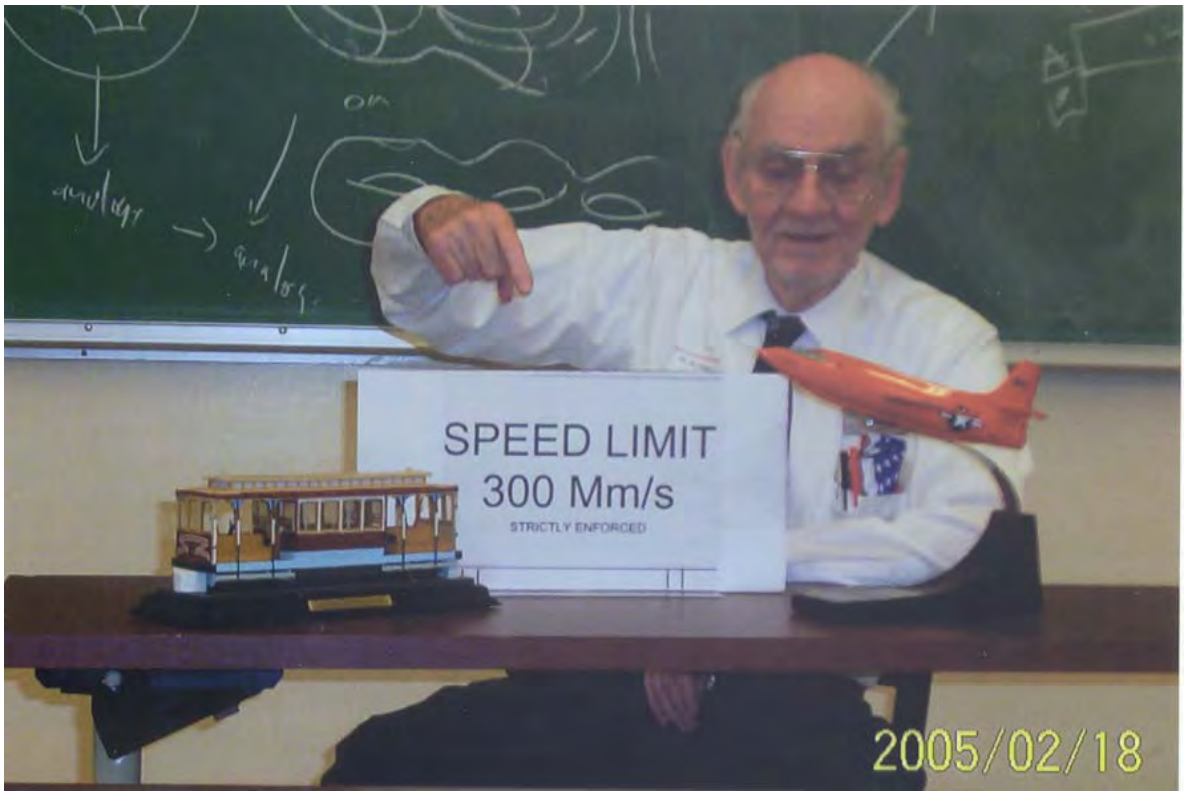
[13] *wir...finden dass die Lichtgeschwindigkeit in unserer Theorie physikalisch die Rolle der unendlich grossen Geshwindigkeiten spielt.*

...A.Einstein, 1905 paper "Zur Elektrodynamik bewegter Korper," in *Annalen der Physik*, p.903

Credits

Special thanks go out to Kirk Mehtlan for his performance with Oscar the Guitar to illustrate the fact that a photon is born and dies at lightspeed as well as spending its life in that realm, just as a tone from a plucked string is born and dies at the string's resonant frequency as well as spending its life there. Oscar played the part of Benji the Banjo.

The following photos of the participants in *situ* are courtesy of Florentin Smarandache.

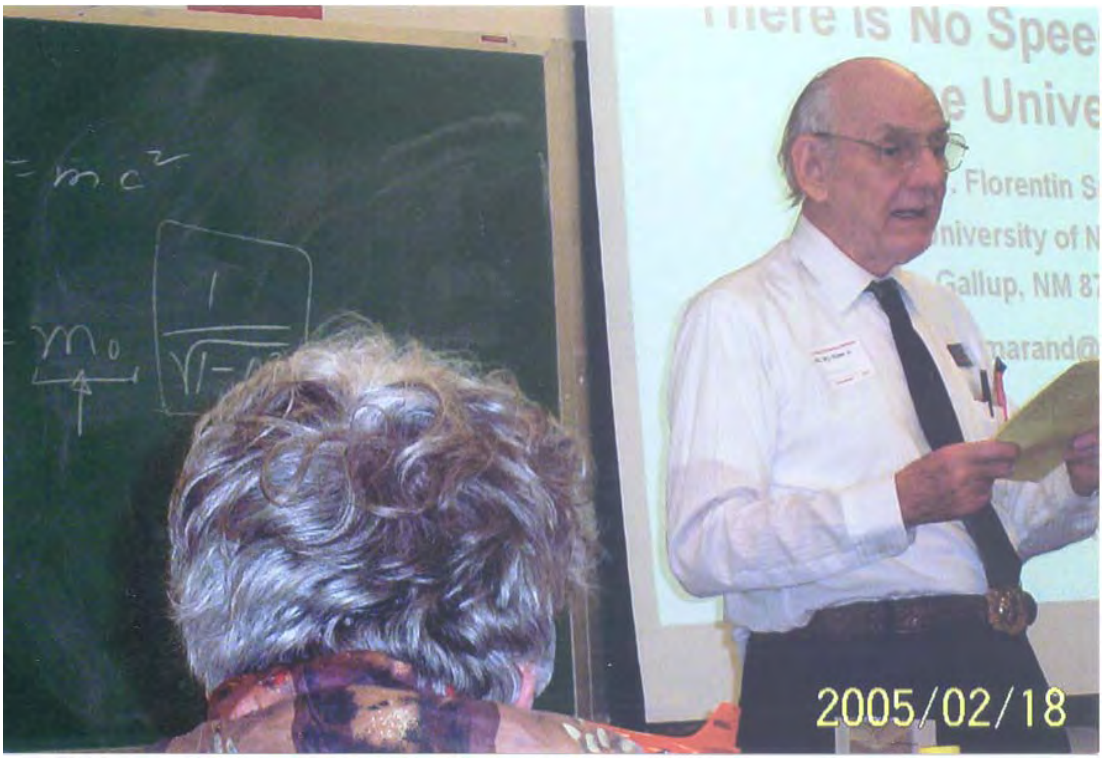


Homer Tilton, Keynote Speaker

L-R: Bill Martin, Jim Malmberg, Jason Ritter,
Steve Hoel, Paul Welsh, Kirk Mehtlan, Greg Holmberg

L-R: Homer Tilton, Mary Ann Smith, Paul Welsh

L-R: Paul Welsh, Jim Malmberg, Kirk Mehtlan,
Jason Ritter, Bill Martin, Steve Hoel, Greg Holmberg



L-R: Mary Ann Smith, Homer Tilton

L-R: Florentin Smarandache, Homer Tilton, Silviu Smarandache (Florentin's younger son)

L-R: Greg Holmberg, Mary Ann Smith

F-B: Jim Malmberg, Jason Ritter, Steve Hoel

L-R: Jim Oliver, Jason Ritter, Florentin Smarandache, Homer Tilton

L-R: Florentin Smarandache, Homer Tilton, Jim Malmberg

L-R: Florentin Smarandache, Mary Ann Smith

At Board: Greg Malmberg
Foreground: Mary Ann Smith

Kirk Mehtlan, with Oscar/Benji

TODAY'S TAKE ON EINSTEIN'S RELATIVITY
Proceedings of the Conference of February 18, 2005

On February 18, 2005 a one-day conference was held at Pima Community College in Tucson, Arizona at which six papers were presented. Things were kicked off with a warm welcome from the PCC-EC president, Dr. Raul Ramirez. There were 14 in attendance including Dr. Ramirez, with papers being proposed by 12 of those plus one paper in absentia. Disciplines represented; astronomy, computer science, engineering physics and mathematics. Papers came from Russia (paper presented in absentia), the University of New Mexico at Gallup, and Pima Community College. Special thanks to Kirk Methlan of PCC-EC for giving us a "demonstration" of postulate 2 of special relativity, the constancy of the velocity of light.

All-in-all, the conference is judged a success, the first of its kind at PCC-EC, and the first ever organized by Homer Tilton.

Thank you, everyone.

For your copy of this Proceedings, contact either Homer Tilton or Florentin Smarandache at the address below.

A call for papers is out for a follow-on, second annual conference "Today's Take on Einstein's Relativity." That conference is planned for February 16, 17 & 18 of 2006. Send an abstract, printed and on disk, of your proposed paper by January 10, 2006 to

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or

Dr. Florentin Smarandache, Conference Co-Chairman
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